THE IRON AGE

New York, October 5, 1916

ESTABLISHED 1855 VOL. 98: No. 14

How a Worcester Plant Controls Production

The Production Department and the Dispatching Division of the Heald Machine Company — Some Details of Its New Machine Shop

BY W. E. FREELAND

THE problem of standardizing repeated operations, centralizing their control and visualizing the actual conditions affecting production in his plant is one of major interest to the modern manufacturer. Just as every business has itself been an evolution, so must every production system be an evolution. Local conditions always prohibit the establishment of a complete standard system adaptable in all its details to any machine shop or metal-working industry. Thus, as in the case of the Heald Machine Company, Worcester, Mass., a production department separate in its functions from the manufacturing department must take storage of materials and directs the work of the engineering department, which in this plant does not include the machine design department. The engineering department plays a part in the routing of the work because upon it rests the burden of tool equipment and upkeep and of much of the work preparatory to actual production. The actual assignment of jobs is delegated to the dispatching division of the manufacturing department.

The routine following the receipt of orders which would bring the stock of assembled machines low is this: The sales manager notifies the management when sales of a particular type of machine

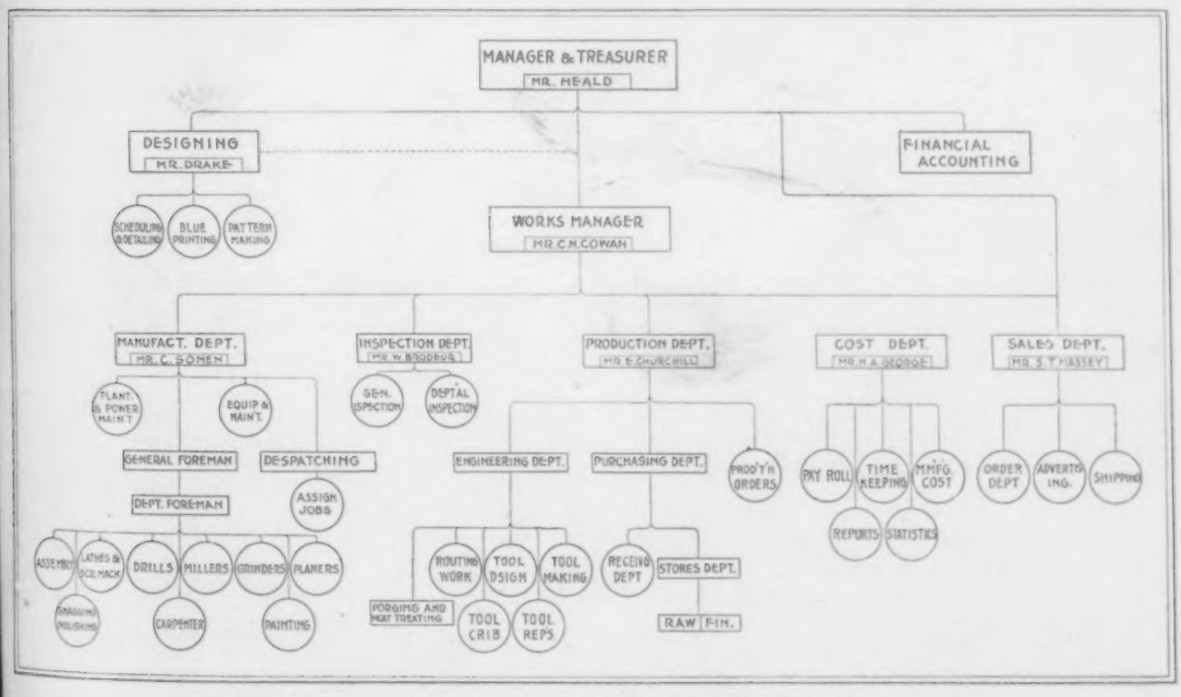


Fig. 1—Organization Chart of the Heald Machine Company

forms and adopt methods distinctive to the plant of which it forms a part.

The organization chart of the Heald Machine Company is interesting because it shows clearly how one concern has divided the executive control of its various activities. The production department has charge of the general planning, issues production orders, supervises the purchasing and are running larger than existing production schedules, and the management decides the number of machines of this type to be made, the works manager setting the date of delivery and issuing his instructions to the production department.

For a concrete example, let us say that these instructions call for the building of 50 K-type machines. The production department first proceeds

to issue a general assembly order for the 50 machines required, notifying the sales and manufacturing departments of the assembly order and date. Its next step is to request from the designing department a complete schedule for 50 machines of K type. This general schedule consists of a considerable number of blueprint sheets (a specimen sheet shown in Fig. 2), bound together on a heavy fiberboard back. The first sheet forms a cover and bears general data regarding the schedule. Below this are several index sheets which give the names and numbers of the parts and units and reference numbers to the succeeding sheets upon which the drawings, units and parts appear. Following these are complete schedules of parts, these sheets having spaces for notations necessary during the progress of actual production.

Upon the receipt of the schedule, the stores department is asked for a report showing the finished parts on hand, parts in process, requirements on all previous schedules, and total of each part or unit available, thereby establishing the balance of each part available for the new schedule. Parts are not made for a specific assembly order, but on parts production orders, as many parts are used upon two or more types of machines.

With this report in hand, the production department issues production orders for the parts not available in stores, and sends a requisition to the purchasing department for needed raw materials. This requisition is made in triplicate on sheets of three colors; a green sheet goes to the purchasing department, a blue sheet to the manufacturing department in the traveler envelope, and a yellow sheet to the cost department. When the stores department receives the raw material, it notifies the production department, giving the quantity, the order number, the assembly number, and the part number if it is a casting. The blue sheet, which goes to the manufacturing department, eventually reaches the cost department through the stores department.

Orders for general assembly, unit assembly or parts production are made out in the same manner on sheets of three different colors. If it is a general assembly or a parts production order, a white sheet is retained by the production department, a pink sheet is sent to the stores department and a yellow sheet to the cost department. For a unit assembly a pink sheet goes to stores, a blue sheet in the traveler envelope goes to manufacturing and a yellow sheet to the cost department. From the pink sheets the stores clerk posts the requirements for each part or unit.

SCHEDULE OF

NO OF MACHS. 50 — #70-71 Internal Grinding Machines — MACH. NOS 850 To 899

DATE June 25,16 — Main Table Clutch And Pinion — ASSEMBLY NO 22600

K Unit #2A — PAGE 10

PART NUMBER	DR SIZE	PART NAME	QUAN REQD	ON HAND	MAKE	ORDER NUMBER	DATE STARTED	QUAN	MATERIAL AND DIMENSIONS
K-22	D	Pinion Shaft Collar	1	48	300	22532			2-1/2" Diameter Screw Stock x 1-1/16" long
		3/8 x 3/4 Sq. Head Set Screw U. S. S. Cup Pt. (C.H.)	1						
K-203	C	Friction Cup	1	32	400	22533			Gray Iron Casting
		#18 Woodruff Key	1						
K-204A	C	Auto Feed Pinion	1	45	250	22534			1-3/4" Diameter 25 Pt. S.S. x 16-3/4" Long
K-381	D	Friction Clutch	1	28	350	22535			Gray Iron Casting. Use Pattern E-321
K-416	D	Friction Finger Cone	1	30	300	22536			2-7/16" Diameter Screw Stock x 2-1/4" long
K-479B	D	Main Table Worm Gear	1	36	200	22537			Bronze Composition Casting #1. Wells Chemical. Use Pattern E-318
PL-38		7/16 Diameter x 1-1/2" Pin (Main Table Worn Gear Pin)	2	675	O.K.				7/16 Diameter Drill Rod x 1-1/2" long
		THESE PINS ARE ASSEMBLED WITH AND CHARGED TO K-479B							
E-375	D	Friction Clutch Stud	1	49	300	22538			3/4 Diameter Screw Stock x 1-3/16" long
E-376	D	Friction Finger	1	40	200	22540			Semi Steel Casting
S-65	D	Friction Finger Screw	1	548	OK				9/16 Diameter Screw Stock x 1-1/8" long
		5/16 - 18 x 5/16 Hex. Nut (Case Hardened)	1						
		ASSEMBLY DRAWING C-K UNIT #2A							

Fig. 2—This Schedule Is Typical of the Detail Sheets in the General Schedule Furnished to the Production Department by the Designing Department. The five white columns in the center are for the use of the production department. The first column shows the quantity of each part reported available by the finished stores department. The second column shows quantities for which parts production orders are issued; the third column the parts production order numbers; the other two columns are filled in as the work progresses

Fig. 3—The Blueprint and Instructions Sheets Belong in the Traveler Envelope. Also included are a triplicate parts production order and a triplicate purchase order for raw mateial. The small card is the job card which is used in the operation of the planning board. The figures ruled off at the bottom of this show that there are four operations on this part. The circle around the figure 1 shows that the tools for this operation have been ordered issued. When this operation is finished a red cross will be drawn through this number 1. The stores requisition is of same form as for unit assembly

The planning board occupies one wall of the superintendent's office. It consists of a series of interchangeable panels to which are attached formed-tin card holders. The job tickets which are placed in these holders come to this office in a traveler envelope from the production department. The traveler is printed upon its face to provide spaces for information concerning the part number, order number, assembly number, drawing number, name of article, material, rough dimensions, number required, material available (date), number delivered, defective stock, finished, etc. The traveler contains a blueprint of drawing of the part and an instruction sheet. If there are several operations to be performed, two or more sheets (measuring 5 x 8 in.) may be required. These instruction sheets give complete details as to the manner in which the operation is to be performed and the tools which are to be employed. It is planned to have at least one job and the necessary tools delivered to each operator before the completion of the job which he has in hand.

It will be noticed that in the illustrations of the job ticket and of the section of the planning board

there are various markings and stickers on the job tickets. In some cases the bottom section of the ticket when in the rack is covered with a strip of colored cardboard. These colored cards help to show the condition of the equipment, tools and work in process. Their use is clearly explained in the following copy of the instructions posted in the dispatching department:

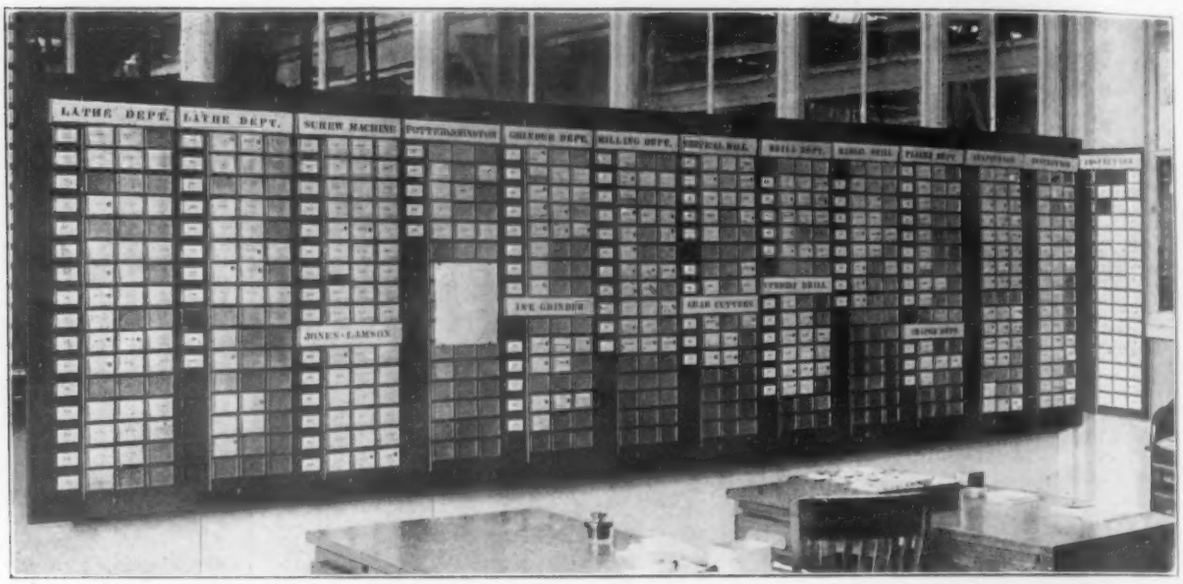
Salmon colored card indicates "Operator out."
Red colored card indicates "Machine broken down."

Blue circle around operation on job card indicates "Tools ordered out."

Red cross through operation number on job card indicates "Operation finished."

On the job card the operations not used are crossed off with a straight black line.

By referring to Figs. 4, 5 and 6 it will be seen that each panel of the planning board is held in place in the frame by buttons and can be moved about as desired. The sign cards designating the classes of machines are placed in large holders simi-



Figs. 4, 5 and 6—The Heald Machine Company's planning board is composed of a series of interchangeable panels held in place in a frame by buttons at top and bottom. The larger cards designating classes of machines can be quickly shifted to any position on the panels as they slide into place over any horizontal row of the smaller card holders.

The first vertical row of cards gives the type and shop number of the individual machines and concise information of their equipment, range and capacity. The second row is the job cards of the work in process on each machine. The third and fourth rows show the jobs ahead in order of precedence. Cards of other jobs ahead of a machine are placed behind the front card in the fourth row

Two special panels give the assembly order number and dates of deliveries of machines and magnetic chucks. Such a board furnishes a quick reference for officials in charge of the assignment of jobs. The small partitioned space below the panel holds cards of different colors which play a part in the working of the planning board

Green colored card indicates "Machine without operator but tooled for important work."

White card stamped "Extra" indicates "Machine working on extra or special operation."

Yellow colored card indicates "Machine will be out of work in one hour."

Green sticker on job card indicates "Work of first importance."

Red sticker on job card indicates "Work of second importance."

lar to the job card holders, and are readily attached to any part of the board over the smaller holders. These two features permit of great flexibility in the general scheme of the board to meet changing conditions. The first row of cards on each panel gives the number of each machine and essential details of its range and capacity. The second row shows the job in process, and the next two

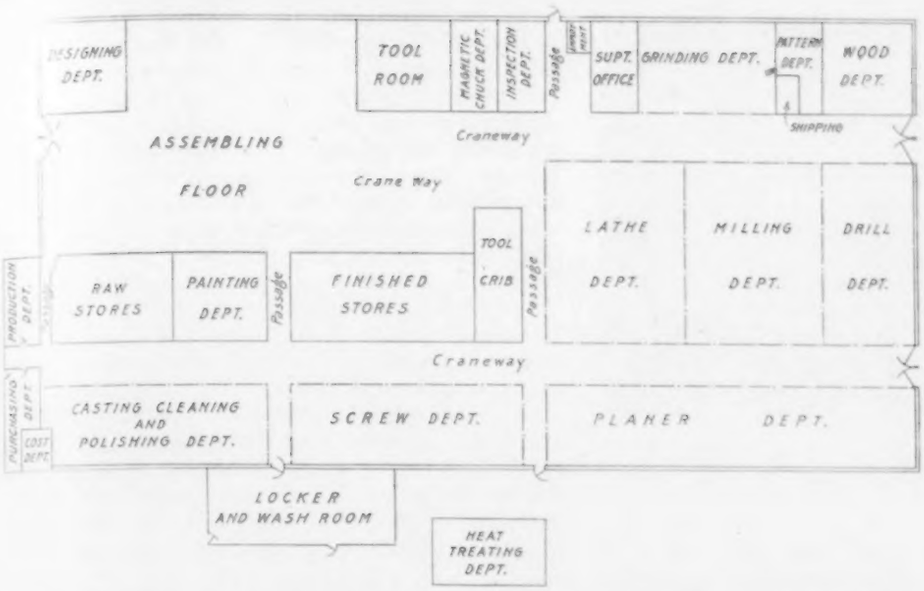


Fig. 7

In the plant of the Heald Machine Company, the offices and drawing rooms are inclosed in glass partitions having 4-ft. base portions: the storage, tool, chuck, carpenter and all except the machine divisions have 3-ft. wire grills above 4-ft. partitions; the machine areas are, of course, not inclosed

rows the jobs ahead as selected by the operating officials. Other jobs ahead of any machine are placed behind the front card in the fourth row. The board receives constant attention, being practically in continuous operation. Two separate panels of different design show the assembly number and the delivery date of each assembly order for machines and magnetic chucks that has reached the manufacturing department.

Traveler envelopes stay with the work. Those that cover jobs not started are kept in specially built boxes in a rack with shelves within easy reach of the clerks in the office. All the travelers of any one assembly order are kept together in a properly labeled box. An extra set of blueprints of the instruction sheets is made and placed in a loose-leaf binder to form a "progress book," in which each operation is checked when completed, and contingent notations are made on these prints. The progress books are checked twice each day.

When a job is assigned, a tool order is issued and sent to the tool crib. Among other items this order gives the hour when tools should reach the designated operator. The tool crib is also notified when a job is finished and promptly sends a collector for the tools.

The traveler is sent with the job when it is assigned for the first operation. A simple form of notification slip is employed by inspectors and foremen to notify the dispatching division when jobs are completed. When the head of the inspection department receives notice that a job is completed he sends a move-man for the work, which is taken to the inspection bench of the department where the work was done. When he sends in his notice that the inspection has been finished, he sends the work and traveler to the department where the next operation will be performed. There is no need to send a notice as to which job ahead of a machine has precedence, as the work of the operator is controlled through the close timing of the tool issue.

The company has recently greatly increased and rearranged its equipment, being enabled to do this by the completion of a large addition. This addition, 160 x 190 ft., increases the total floor space of the plant to about 100,000 sq. ft. The new part,

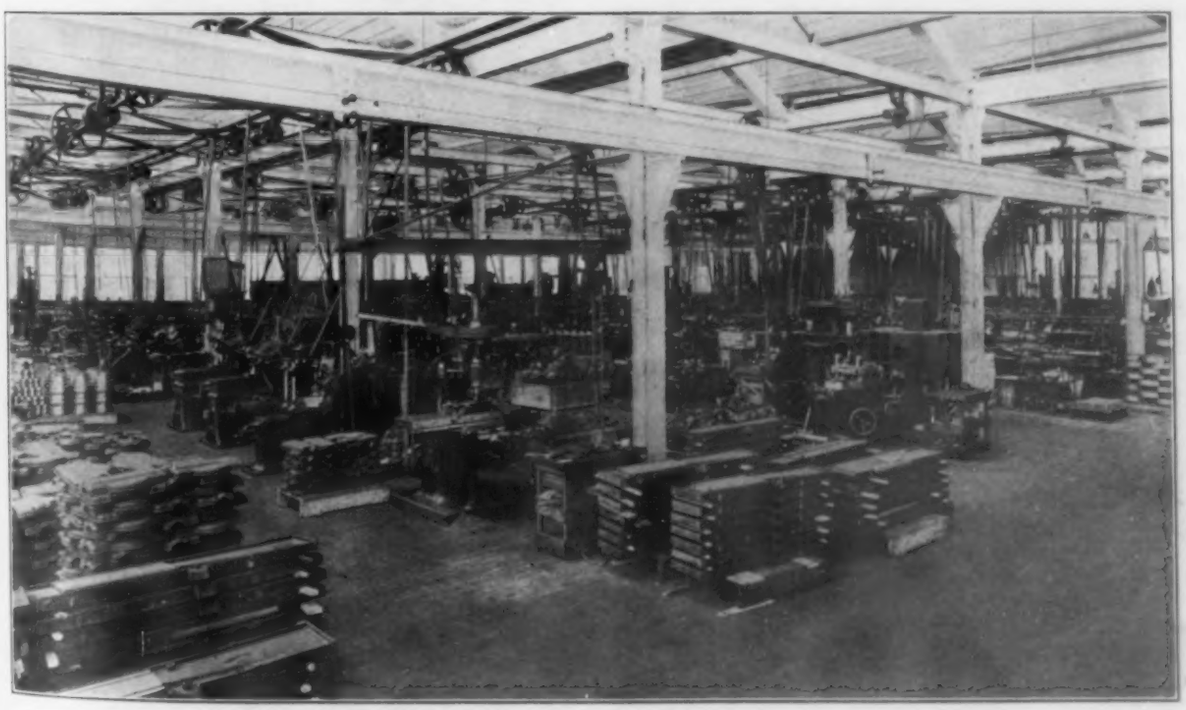


Fig. 8—Wide aisles and generous spacing of machines in the machine shop help in the transportation and machining of large lots

Fig. 9—In planning the machine locations special attention was given to providing space for several conveyor platform loads near all machines which have a large output per day

like the old, is one story high and has a saw-tooth roof. The longitudinal roof girders are of double steel beams and the transverse girders are heavy I-beams supported by steel columns. As first designed the saw-tooth portions were to have been supported by the usual steel trusses, but a considerable saving in cost was made without loss of strength by making the supporting members of heavy wooden beams. The absence of the steel trusses, with the consequent elimination of the light-obstructing and dust-collecting properties inherent in that type of construction, is one of the pleasing features of the new shop.

The double channel-iron girders permit of flexibility in the hanging of shafting. In some cases the hangers are attached directly to the girders by bolting through the opening in the beams; in other cases parallel wooden beams are suspended below the girders by the same method and the hangers attached to them. An entire line of shafting when attached by either method can be quickly moved about to correspond with changes in machine locations. The various motors are placed on platforms firmly bolted and braced to the vertical steel columns.

A series of experiments has produced an unusually satisfactory and economical artificial lighting installation. As first planned by experts, the artificial illumination was to have been secured wholly from overhead lamps of 100-watt size, located in two rows in each saw-tooth section—one row

Fig. 10—Assembling of machines is done by groups and not by individual machines. Thus all the machines on an assembling order come off the floor practically simultaneously

to be suspended from the peak and the other from points near the bottom of the southern slope of the saw-teeth. These lamps were to be inclosed in reflectors which would throw the light downward in a cone of comparatively small diameter. As finally worked out, the lamps (four to each bay formed by the girders) are of 60-watt size and the reflectors are of the intermediate type forming a cone considerably broader than as first planned. The lights have been lowered so that they hang just below the belts on the countershafts.

An independent feed line, which is kept alive all day, supplies current for individual 25-watt lamps supported by universal arm fixtures, so that any operator who needs light for boring, undercutting and similar operations has it available at any time. It is believed that the present arrangement and sizes of lamps produce a more even and efficient illumination and with less eye strain than any other of the plans tried. Yet this better lighting is secured usually by a combination of two

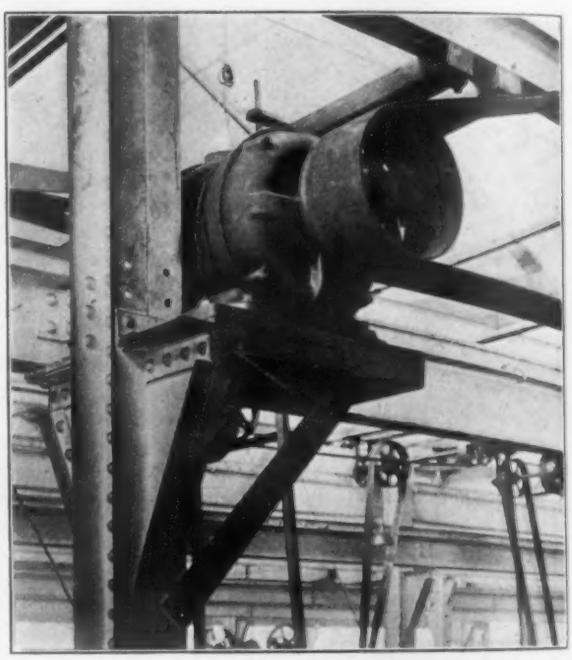


Fig. 11—The type of building construction lends itself admirably to a rigid method of motor suspension

lamps—an overhead and a drop light—with a total of 85 watts in place of one 100-watt lamp overhead.

One of the most quickly noticed features of this plant is the wide aisles and other open spaces about machines. This liberal spacing of machines is a helpful feature in the handling of large jobs and in the use of the numerous conveyor trucks with which the work is transported from place to place. The shop is also liberally supplied with traveling cranes wherever heavy lifting is necessary.

The origin of the Heald Machine Company is found in the business started by Stephen Heald in 1830 in Barre, Mass. Wood-working and agricultural machinery were the first products, and wire-drawing machinery was later added. Along in the 50's an iron foundry was added and coal and iron brought by teams from the railroad 20 miles away. Two sons later entered the business, which continued until the death of Stephen Heald in 1887. The business languished for two or three years while the estate was being settled, and in 1890 was taken over by L. S. Heald & Son, son and grandson of the founder. In 1903 James N. Heald bought out his father's interest, moved the business to Worcester and organized the present company. The man-

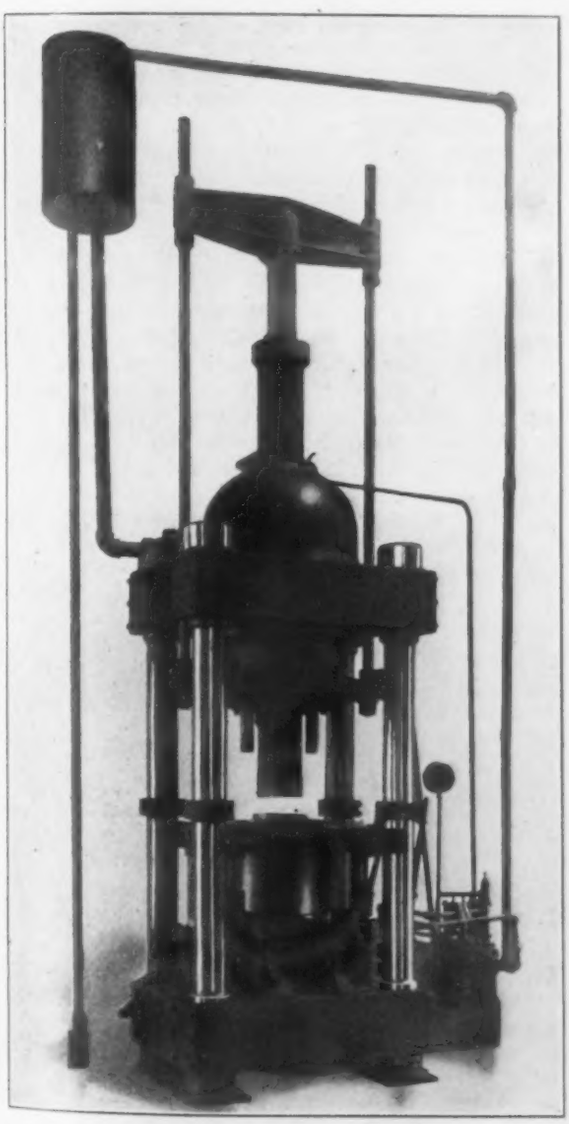
ufacture of grinding machines had become a large factor in the business previous to the removal to Worcester, and since that time a comprehensive line of internal and surface grinding machines, and more recently a successful line of magnetic chucks, have been developed, which have had a large sale, both domestic and foreign.

The first shop in Worcester, built in 1903, contained but 9000 sq. ft. In 1907 additions brought the size of the shop to 23,500 sq. ft. and a boiler house was built. In 1909 an electric power plant of 100-kw. capacity was added. In 1911 an addition, 100 x 220 ft., widely described at the time of its erection because of its new features, was built. In thirteen years the number of hands employed has increased from 22 to 325.

Paul B. Morgan, treasurer Morgan Construction Company, Worcester, is president and James N. Heald is treasurer of the company. Mr. Heald is general manager; Cyrus N. Cowan, works manager, and S. T. Massey, sales manager.

Press for Briquetting Metal Turnings

A line of hydraulic presses for briquetting metal turnings, borings, etc., has been developed by the Hydraulic Press Mfg. Company, Mount Gilead, Ohio. The press is of the four-rod inverted cylinder type and is built in three different sizes and pressure capacities ranging from 300 to 1000 tons, the last being the one illustrated. It enables this class of scrap material to be put in convenient form for handling and to be remelted without loss of valuable ingredients and oxidation is prevented. One of the particularly interesting features of the press is the mechanism for forming a briquet.



In this Hydraulic Press for Briquetting Metal Borings, Turnings, Etc., for Remelting, the Material Is Placed in a Floating Mold Supported by Four Springs and Sliding Over a Stationary Plunger

In operation the material is placed in a floating mold supported by four springs. When pressure is applied from above, the friction of the material on the sides of the mold causes the latter to move down over a stationary plunger projecting into the mold from below. This arrangement, which is somewhat unique in design and operation, causes pressure to be applied on both the top and bottom of the material which, it is emphasized, gives a briquet of uniform density. All of the movements of the press are controlled by levers conveniently located for the operator.

After the briquet has been formed the lower plunger is removed by a lever located near the main operating valve and the briquet is ejected from the mold by pressure applied by the main ram. Hydraulic push cylinders are employed to lift the floating mold while the lower plunger is withdrawn or returned to place on this size of press and also the middle size, which has a capacity of 750 tons. In the 300-ton press a collar surrounding the plunger is held against the mold by a spring. When the briquet is ejected from the mold it falls to the base of the press and is removed by a conveyor.

A surge tank located above the main cylinder is provided for this press. A simple movement of the valve lever brings the plunger to bear on the material in the mold and the suction caused by this action fills the main cylinder with fluid. In this way the first stroke of the pump produces pressure upon the material being handled. When the pressing operation is completed the main ram is returned by an auxiliary one located at the extreme top of the press and the fluid is returned to the surge tank.

A Safety Manual for Blast-Furnace Workers

The precautions to be observed by the foremen and other employees at blast-furnace plants to avoid accidents are described at some length in technical paper No. 136 of the Bureau of Mines. The author, Frederick H. Willcox, first describes the method of attacking the accident problem by using a plant-inspection committee composed of two to four men selected from the sub-foremen and workmen. The duties of this committee, which comprise a study of accidents that have happened and the inspection of the plant for improper physical conditions and unsafe practices, are touched upon and methods of obtaining co-operation on the part of the employees and of putting the recommendations of the plant-inspection committee into effect are outlined. The larger portion of the paper is given over to directions for avoiding accidents, with detailed instructions to the various groups of employees, including the engine room and boiler house forces. These instructions are supplemented by numerous engravings illustrating the unsafe and safe ways of performing various operations. Notes on first aid are included.

British Imports of Manganese Ore

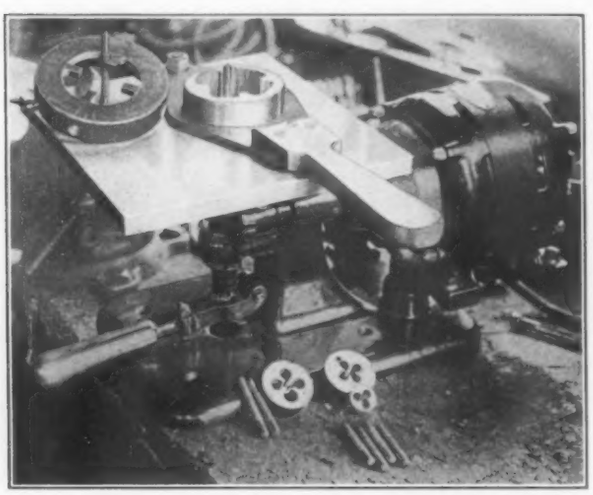
British imports of manganese ore in August were 46,606 gross tons, against 10,611 tons in August, 1915, and 33,817 tons last July. The total for the eight months to Sept. 1, 1916, is 306,005 tons, contrasted with 164,769 tons to Sept. 1, 1915. The receipts thus far this year are at the rate of 38,250 tons per month, as against only 20,596 tons per month for the first eight months of 1915. The manganese ore situation in England is therefore easier now than at any time during the war.

FINISHING EDGES OF DIES

How Threading and Blanking Types Are Made on a Special Machine

The Anderson Die Machine Company, Bridgeport, Conn., has designed and built a die-forming machine. As the name indicates it is intended for finishing blanking and threading the dies and similar work after the core or surplus stock has been drilled out. The machine is driven by a motor receiving power from the nearest lighting socket, and it is emphasized that the machine is more rapid than a filing machine of the reciprocating type, since the cut is constant and change of contour of the surface operated on does not necessitate a corresponding change of cutter.

The machine consists of a main frame containing a vertical work spindle which is driven by a shaft at right angles to it that is connected to the motor by a semi-flexible coupling and to the spindle by a pair of spiral gears. The work table or platen

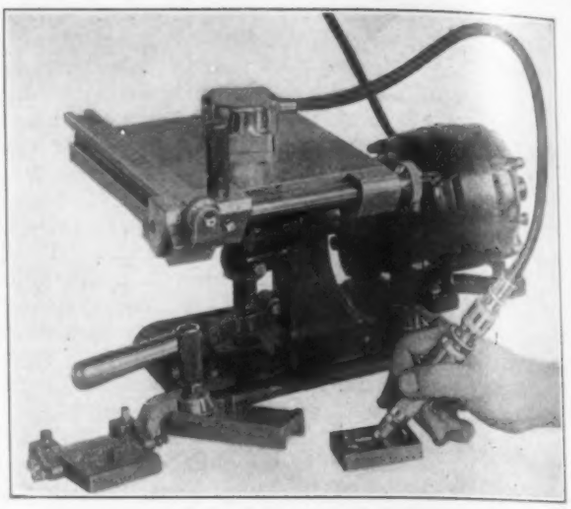


Finishing the Cutting Edges of a Threading Die in a Specially Developed Die Forming Machine

is adjusted to give a surface at right angles to the center line of the spindle.

The cutters, which are mounted in a collet, operate on the principle of a hardened ratchet screw to shear material off the work operated on when rotating at high speed. The pitch of this screw is relied upon to cause the work to be drawn down on the platen and also carry the chips down and leave the line marked out on the blank visible at all times. This arrangement, it is explained, does away with feed screws, slides or vises in which to hold or control the work upon which the machine is operating. The collet is opened for the removal or changing of cutters by a lever conveniently located at the front of the machine. This lever is pivoted on the frame and when raised comes in contact with the lower end of the draw-in spindle, thus compressing the spring and forcing the collet upward and open. The main spindle is hardened and ground and runs in bronze bearings, the upper of which is of the double angle type, while the lower is straight and adjustable for wear. An adjustable thrust collar bearing on the lower face of the upper bearing is provided, and a knurled ring on the end of the spindle is relied upon to prevent chips or dust from entering the bearing.

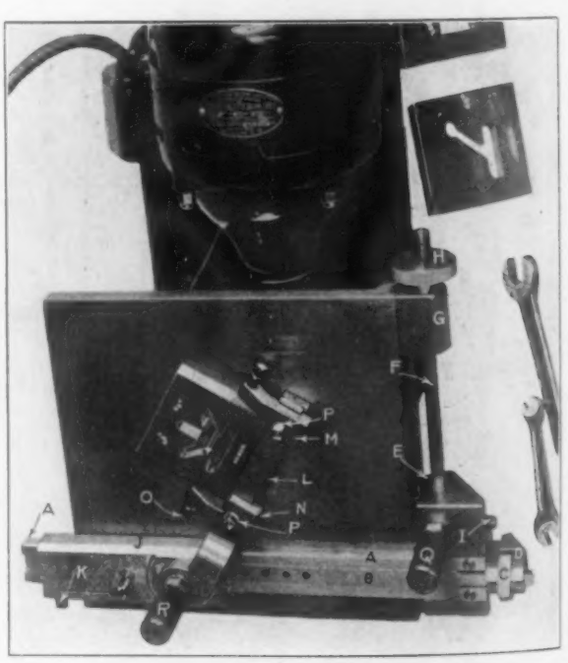
When threading dies are being finished, the die, which has previously had as many holes drilled in it as there are cutting edges required, is dropped into a central opening in the work holder or lever.



Putting the Finishing Touches on a Blanking Die by Hand with a Cutter Receiving Power from the Spindle of the Machine through a Flexible Shaft Connection

The die fits freely into this opening and a former of machine or tool steel which has been hardened to resist wear is placed over the die. This former has four or more projections, depending on the number of cutting edges on the die, and these are the same width as the portion of the finished die that will produce the thread. A special cutter having a blank portion where it comes in contact with the projections of the former is inserted in the collet. This blank portion is relied upon to limit the amount of material to be removed and also serves to establish a uniform tooth width. The die holder is moved back and forth by a handle and the die is rotated until the cutter comes in contact with the portion of the die to be operated on.

A special type of controlling mechanism is provided where it is desired to finish the sides of a die at an angle with the base. In this mechanism the bar *A* extends across the machine at right angles to the side of the rectangular machine table, this bar being secured to the main slide, which guides it at right angles to the die or the table. A strip or bar *B* extends nearly across the bar *A* and has a series of holes in the top face, while the outer end is threaded. A knurled nut *C* is located



The Mechanism Controlling the Movement of the Die That Is Being Finished with Relation to the Cutter Spindle

on the threaded portion of the bar and is secured from side motion by the bracket *D*, which forms a part of the main slide. Turning the knurled nut in either direction causes the bar *B* to be moved correspondingly. The main slide is secured to the table by a dovetail, and together with the bar *A* can be moved by hand in either direction. A plate *E* is fitted to the lower side of the block to give a sliding fit at all times. If desired the main slide can be locked with a screw. A bar *F* passes through the main slide and extends toward the back of the machine, the rear end of the bar being threaded. The block *G* is fastened securely at the rear edge of the table and a knurled nut *H* is secured in the block to prevent movement in either direction. The turning of this nut in either direction causes the bar *F* to move either forward or back. A set screw *I* is mounted in the slide and is designed to engage the bar *F*, thus causing the main slide to move in the same direction as the rod. The slide *J* is mounted on the bar *A* and normally can be moved by hand in either direction throughout the width of the table or locked in any position by the screw *K*. A knurled plug passes through the slide *J* and engages the holes in the bar *B*. If the slide is permitted to move freely, a fine adjustment of it on the bar *A* can be secured by turning the knurled nut *C*. An arm *L* is also mounted on the slide *J* and can be swung at any angle in relation to the bar *A*, the edge being graduated to indicate the degree of angularity. Two holding members *M* and *N* are fastened to the bar *L* and set screws *O* are em-

A Blanking Die Being Finished by Milling Away the Rough Edges Left After the Core Has Been Drilled Out

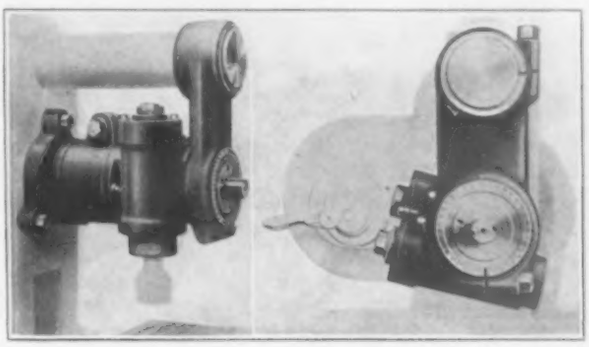
ployed to fasten the die or work being operated on to the holding members, which are locked in their positions on the arm *L* through the screws *P*.

In operation the die is secured in place and the slide *J* is engaged in one of the holes in the bar *B*. After the main slide is unlocked, the amount of material to be removed in one cut is adjusted by manipulating the nut *C*, after which the die is fed by sliding the bar *A* by hand. After this material has been removed the operation is repeated until the desired depth has been secured. To remove material in the opposite direction, the slide *J* is left free and the rod *F* is secured to the main slide by the set screw *I*, so that when the nut *H* is turned the die can be adjusted to have the cutter take off the proper amount of metal. The handles *Q* and *R* serve to assist in feeding the die against the cutter. In this way, it is pointed out, practically any surface can be finished by swinging the arm *L* and the slide *J* to give the various angles required.

Finishing touches can also be put on a blanking die by hand by connecting a flexible shaft to the spindle of the machine by a special fixture and using a rapidly rotating cutter.

A Semi-Universal Milling Attachment

A new design of semi-universal attachment has been developed by the Valley City Machine Works, Grand Rapids, Mich., for use on its No. 1½ milling machine. The particular advantage claimed for the use of this attachment is that the operator can get closer



A Semi-Universal Attachment for Milling Machines Capable of Adjustment to Either a Vertical or Angular Position

to angular cuts without sacrificing rigidity of support Although the attachment was designed primarily for use on the builder's machines, it can also be applied to other makes with slight modifications.

The attachment swings clear under the overarm and if desired may be reversed. When the spindle is in a vertical position the hole through it is readily accessible, a feature that is made possible by offsetting the spindle of the attachment from that of the machine proper.

The attachment spindle rotates in the same direction as the main one, and is fitted with a No. 10 taper. The drive is through a splined arbor, coarse pitch miter gears, an intermediate ball-bearing shaft and a pair of heavy steel spur gears as the final drive.

A clamp base, which is bored to fit the spindle box and is secured to the column with screws, is furnished with the attachment.

Franklin Institute Lectures

The Franklin Institute, Philadelphia, has arranged a program of lectures for the winter of 1916-17, included in which are the following:

Oct. 18, 1916—"Scientific Research in Relation to the Industries," by Charles P. Steinmetz, chief consulting engineer, General Electric Company, Schenectady, N. Y.

Dec. 14, 1916—"The Cooling of Water for Power Plant Purposes," by C. C. Thomas, professor of mechanical engineering, Johns Hopkins University, Baltimore, Md.

Feb. 1, 1917—"The By-Product Coking Industry," by C. J. Ramsburg, vice-president H. Koppers Company and Pittsburgh By-Product Coking Company, Pittsburgh, Pa.

March 1, 1917—"Development and Progress in Aviation Motors," by Henry Souther, consulting engineer, aviation section, U. S. Army, War Department, Washington, D. C.

March 15, 1917—"Design, Construction and Equipment of a Modern Military Aeroplane," by Jerome C. Hunsaker, assistant naval constructor, Navy Department, Washington, D. C.

A Steel Plant for Siberia

A new iron and steel plant in Siberia is contemplated. The plan, as a result of a recent meeting between representatives of the Russian Government and of the iron industry, is to raise a capital of 20,000,000 rubles, the interest to be guaranteed to the banks subscribing. The government is to lease the district of Kusnezk, where the works are to be located, to the company for 60 years, the company to supply a fixed tonnage of rails and other railroad material yearly at current prices. This district has coal and iron deposits estimated at 1594 million poods, the ore having an iron content of 58 to 65 per cent. Agricultural implements are also to be made.

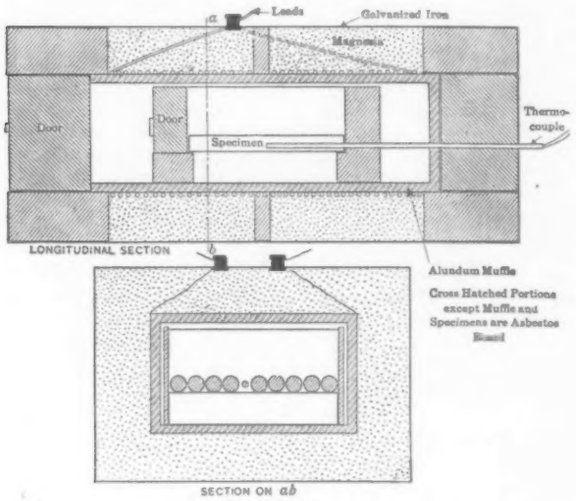
Effect of Sulphur on Low-Carbon Steel*

A Comparison of the Static and Dynamic Properties of High and Low Sulphur Steels Uniformly Heat Treated — Sulphur Detrimental in Shock Tests

BY CARLE R. HAYWARD*

SULPHUR has long been one of the banes of the steel manufacturer and often no effort and expense have been spared in order to reduce it to a small per cent in the finished product. This condition is due to a general conviction that in many cases where steels have failed in service, sulphur has been the cause. But there has been a growing feeling in recent years that the verdict against sulphur has been unnecessarily severe. In cases of segregation it was present in augmented amounts along with other impurities, but it had not caused the segregation.

High sulphur in pig iron is caused by poor furnace conditions and the sulphur is merely one indication of an iron that has not been properly reduced. No amount of subsequent treatment under



Sections of the Heat-Treatment Furnace Used in Treating the Low Carbon Steels

oxidizing conditions in the open-hearth furnace can remedy the defects, although the per cent of sulphur may be considerably reduced. In other words, the causes of bad steel can frequently be traced back to bad pig iron, and sulphur is merely one indication that the pig iron is bad. The writer recently visited a steel plant where a mass of evidence had been accumulated which substantiated this fact, and the superintendent was emphatic in stating that high sulphur was not harmful provided the steel was not otherwise poor due to insufficient reduction in the blast furnace.

The presence of a moderate amount of sulphur is desirable from the standpoint of the man who machines the steel. The low-sulphur material drags and the production of a smooth surface is very difficult. A slight increase in sulphur enables the machinist to produce a smooth surface without difficulty. Since, therefore, such large quantities of steel are subjected to machining, it becomes highly important that the sulphur controversy should be settled, and if its presence is proved to be harmless the ban on it should be lifted.

Among the recent papers on the effect of sulphur on steel is one by Dr. J. S. Unger, manager central research bureau, Carnegie Steel Company.† The results of an exhaustive series of tests are given and the conclusion states:

> The author does not advocate paying no attention whatever to sulphur content in steel, but believes firmly that a steel containing less than 0.100 per cent is not necessarily bad, and that it will show little, if any, difference in quality when compared with the same steel of much lower sulphur, other conditions being the same.

The present investigation was undertaken at the suggestion of A. H. Annan of the Rhode Island Tool Company, who co-operated by furnishing the steel and machining the specimens. The results are presented as a contribution to the general knowledge on the subject.

THE STEELS USED

It was planned to use three steels of different sulphur content, but with the other elements the same. The manganese was an exception, however, for with this element part is in the form of MnS existing free in the steel and the remainder is dissolved in the steel. It is evident, therefore, that the manganese should vary, but that the amount in excess of MnS should be constant in the different steels. The steels finally selected were in the form of ¾-in. round bars. Two bars of each grade were required to furnish sufficient specimens. The analyses are shown in Table 1.

Table 1—Analysis of Steels Used in Equipments

Mark	Carbon, Per Cent	Total Manganese, Per Cent	Excess Manganese, Per Cent	Phosphorus, Per Cent	Silicon, Per Cent	Sulphur, Per Cent
1	0.18	0.55	0.48	0.007	0.01	0.038
1A	0.18	0.57	0.50	0.009	0.02	0.041
2	0.17	0.67	0.52	0.008	0.01	0.086
2A	0.18	0.70	0.55	0.010	0.03	0.087
3	0.18	0.80	0.54	0.006	0.02	0.152
3A	0.17	0.80	0.55	0.011	0.03	0.148

THE HEAT TREATMENT

In order to make a comparison of the steels under different conditions it was decided to heat all the specimens to a temperature just above the critical range, quench in water, and reheat different lots to 300, 400, 500 and 600 deg. C. respectively. For this purpose the bars were cut in 7-in. lengths, which was sufficient for tensile specimens and specimens for microscopic examination.

The furnace used is shown in the illustration. The muffle is made of alundum and is 2 in. high, 9 in. wide and 16 in. long. It is wound with No. 15 excello resistance wire. In order to obtain uniform heating of the specimens, they were supported on an asbestos rack, as shown. Asbestos shields were placed on the sides and ends of the rack so that the specimens were practically in a muffle within a muffle. A platinum, platinum-rhodium thermo-

*From a paper to be presented at the meeting of the American Institute of Mining Engineers in New York in February, 1917. The author is assistant professor of mining engineering and metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

†THE IRON AGE, Jan. 13, 1916.

couple was introduced through the back of the muffle into the center of the heating chamber and connected to a Siemens and Halske recording galvanometer.

The procedure in heat treatment was as follows:

The furnace was heated to 880 deg. C. and nine specimens introduced. This caused the temperature to fall to 550 deg. C. and it took about 40 min. to again reach 880 deg. When the latter temperature was reached it was maintained constant for 15 min., after which the specimens, except as noted below, were quenched in water and a new lot introduced into the furnace. This was continued until about 18 of the specimens had been treated. Nine of these, consisting of three high-, three medium- and three low-sulphur steels, were removed from the furnace and allowed to cool in air. The remaining nine, consisting of three of each sulphur content, were allowed to cool in the furnace.

In drawing the quenched specimens at the various temperatures, the procedure was as follows:

The furnace was heated to 600 deg. C. and nine specimens, three of each sulphur content, were introduced. The temperature fell and it required about 30 min. to come back to 600 deg. It was maintained here for 10 min. and then the specimens were withdrawn and quenched in water. The furnace was cooled to 500 deg. C. and another set of nine specimens was introduced. When the temperature had regained 500 deg. it was maintained constant for 10 min. and then the specimens were withdrawn and quenched. Following a similar procedure, sets of nine specimens were treated at 400 and 300 deg. C. respectively.

THE TENSILE TESTS

After sawing off ¾ in. from each piece for microscopic examination, standard test specimens were prepared with 2-in. gage length, 0.505-in. diameter and threaded ends. These were pulled in an Olsen machine in the testing laboratory of the Massachusetts Institute of Technology. The results obtained are given in a table in the paper. The averages are retabulated in Table 2. The designations *L*, *M* and *H* refer to low, medium and high sulphur content.

Table 2—Average Tensile Results of the Treated Specimens

	Yield Point, Lb. Per Sq. In.	Breaking Load, Lb. Per Sq. In.	Elongation, Per Cent in 2 In.	Reduction of Area, Per Cent
Heated to 860 deg. C. and quenched in ice water:				
L	57,900	85,600	23.5	63.1
M	53,600	77,700	27.7	70.1
H	56,900	86,000	22.0	60.7
Heated to 860 deg. C. and cooled in still air:				
L	43,200	58,400	41.5	67.8
M	46,000	58,000	41.3	68.5
H	42,600	59,400	39.0	63.9
Heated to 860 deg. C. and cooled in furnace:				
L	36,500	52,600	40.5	63.2
M	36,800	53,000	40.3	61.6
H	35,100	55,000	38.0	63.0
Quenched at 860 deg. in ice water. Reheated to 300 deg.:				
L	55,900	75,675	26.5	70.0
M	59,500	75,000	26.7	71.4
H	57,500	87,800	21.5	60.7
Quenched at 860 deg. in ice water. Reheated to 400 deg.:				
L	60,300	76,300	28.8	72.1
M	62,600	76,600	26.3	70.0
H	62,400	83,200	22.3	62.4
Quenched at 860 deg. in ice water. Reheated to 500 deg.:				
L	57,000	72,700	32.0	73.5
M	59,700	73,300	29.0	71.8
H	60,900	78,000	26.0	67.0
Quenched at 860 deg. in ice water. Reheated to 600 deg.:				
L	52,200	68,800	34.2	75.5
M	53,600	71,100	33.0	73.5
H	55,200	74,600	30.5	70.7

There is not sufficient variation in the results to make an effective plot, but Table 3 summarizes the figures by giving the order in which they occur from high to low.

After concluding the tensile tests, it was thought desirable to determine the effect of varying sulphur content on specimens subjected to shock.

SHOCK TESTS

Through the kindness of the testing department of the Watertown Arsenal, their Charpy machine was obtained for this purpose. The remaining ¾-in. stock of bars marked 1, 2 and 3 were sawed into 2-in. lengths and the specimens subjected to heat treatment in sets of three under the same conditions that obtained in the case of the tensile specimens. After heat treatment, the specimens were machined to conform to the following specifications:

Table 3—Summary of Tensile Tests Showing Rank

	Yield Point			Breaking Load			Elongation			Reduction of Area		
	L	*M*	*H*	*L*	*M*	*H*	*L*	*M*	*H*	*L*	*M*	*H*
Quenched in ice water..	1	3	2	2	3	1	3	1	2	3	1	2
Cooled in still air.....	2	1	3	2	3	1	1	2	3	2	1	3
Cooled in furnace.....	2	1	3	3	2	1	1	2	3	2	3	1
Reheated to 300 deg....	3	1	2	2	3	1	3	1	2	3	1	2
Reheated to 400 deg....	3	1	2	3	2	1	1	2	3	1	2	3
Reheated to 500 deg....	3	2	1	3	2	1	1	2	3	1	2	3
Reheated to 600 deg....	3	2	1	3	2	1	1	2	3	1	2	3
Totals	17	11	14	18	17	7	11	12	19	13	12	17
Order of totals.....	3	1	2	3	2	1	1	2	3	2	1	3

Length 55 mm., cross-section 10 by 10 mm., notch across one side, midway between the ends, 1 mm. wide. Radius of cutter edge, 2/3 mm.

The Charpy machine consists of a heavy pendulum which drops from a fixed height, strikes the specimen supported at each end and breaks it at the notch. The pendulum then continues its swing and the height it reaches is registered. Knowing the weight of the pendulum, the height it falls and the height it rises, a simple calculation gives the energy consumed in breaking the specimen.

(Photomicrographs of some of the specimens are given in the paper.)

CONCLUSIONS

Table 3, which expresses the summary of the tensile tests, shows that the high-sulphur steel has for each treatment the highest breaking load while the yield point ranks first for two treatments, second for three and third for two. From this we may conclude that the sulphur does not lower the tensile strength.

The figures for elongation and reduction of area show that there is little difference in ductility between the low- and medium-sulphur steels, but the ductility of the high-sulphur steel is slightly lower than the other two for most of the treatments.

The average figures for the shock tests, except for the air- and furnace-cooled specimens, are highest for each treatment in the case of the low-sulphur steels, and lowest for each treatment for the high-sulphur steels. The widest difference appears in the steels which have been quenched and reheated.

It is difficult to draw definite conclusions from the results because of the newness of the shock test and the difference of opinion among engineers regarding its value. The tensile tests are not unfavorable to steels with moderate amounts of sulphur, while the shock tests show a decided falling off in strength as the sulphur increases. Until the interpretation of the results from the Charpy machine is more fully understood, it is impossible to say to which set of tests the most importance should be attached.

Further light might be thrown on the subject by making alternate stress or fatigue tests. It

would be important to learn whether the results would confirm the tensile or shock tests. Unfortunately, however, the stock of steels used in the previous work was exhausted, and whatever the results of the fatigue tests there would be an uncertainty in their interpretation because of difference in stock. It was, therefore, decided not to include this series in the present investigation.

Salvaging Rails with a Motor Truck

An interesting use of a motor truck is being made by the Black Hills Transfer Company, Nahant, Mont. This company has the contract for salvaging the rails on an abandoned logging railroad connecting the station at Nahant on the Burlington system with some timber lands 35 miles west of the town. For this work the company is using a 1½-ton White motor truck.

The line from which the rails are being recovered was abandoned several years ago on account of the exhaustion of timber and the enforcement of the forest reserve act. Several obstacles confronted the transfer company when it received

Using a 1½-Ton Motor Truck Equipped with Flanged Wheels to Recover the Rails of an Abandoned Lumber Railroad. The Truck Also Hauls a Standard Flat Car as a Trailer, the Capacity of the Two Being 12 Tons

the contract. It was not possible to use a locomotive to haul the rails because the forest reserve laws require oil-burning locomotives and only those burning wood were available. The track was not, of course, kept in repair and the cost of putting it in shape to enable a heavy locomotive to run over it was prohibitive. A rank growth of long and tough grass over the rails, in some cases 18 in. high, had woven a network that completely obstructed them from view which was another objection to the use of a locomotive.

When the truck was received from the builder it was fitted with flanged steel wheels and a special rear truck provided. A standard flat car was also used as a trailer and with this equipment it was possible to haul 12 tons of rails into Nahant each trip. The truck made two round trips a day, 140 miles, climbing several grades as steep as 7 per cent. In the first month the truck was in service it covered approximately 3300 miles, or an average of 108 miles per day. In several cases more than 10 miles were run on 1 gal. of gasoline.

The total number of controlled establishments under the Munitions of War acts in Great Britain is now 4212.

Carriage Builders Hold Annual Meeting

The Carriage Builders' National Association held its forty-fourth annual meeting at the Hotel Gibson, Cincinnati, Ohio, Sept. 26, 27 and 28. The meeting was called to order by President P. E. Ebrenz, St. Louis, and the address of welcome was made by Mayor George Puchta of Cincinnati. Manufacturers from all parts of the country were present and exhibits were held in the banquet hall of the Hotel Gibson.

On Wednesday an interesting address was made by Charles E. Adams, president Cleveland Hardware Company, Cleveland, who spoke in part as follows: "Steel and iron products are selling to-day at a price that will not decrease before 1919. As steel goes, so go the world and its products. The man who sells a commodity at less than current prices because he was fortunate enough a few years ago to lay a large supply in stock is an industrial suicide. He never will again be able to duplicate the prices of 1913. Nor will labor again be as cheap as before the European war. The laboring man of this country has been given a touch of luxury and unprecedented prosperity and will not return to the wage scale of a few years ago. He has already begun to demand an annual vacation. He does not request it. He is America's most independent class. I predict that the highest priced labor in the United States will be the day labor, and this will come before July 1, 1917. The cessation of immigration has caused this condition. The United States to-day has 2,000,000 less foreign laborers than in 1913, and the foreign element that once used the pick and shovel has since graduated to a position where skill is required."

C. P. Heindell, Charlotte, N. C., who made an address on "The Buggy in the South," disputed statements recently made by automobile manufacturers that the horse-drawn vehicle would soon be a matter of the past.

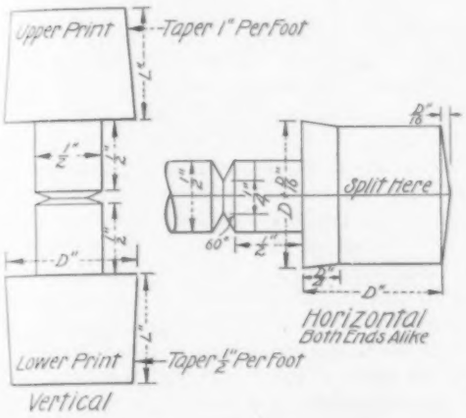
The attendance was larger than at any previous convention and 42 active members were added to the association, while 70 salesmen were enrolled as associate members.

Theodore Luth, Cincinnati, was elected president by acclamation. The next convention will be held in Chicago at a date to be selected by the board of directors.

The American Mining Congress will open its nineteenth annual session at Hotel LaSalle, Chicago, Nov. 13. Secretary J. F. Callbreath states that the convention promises to be the largest gathering of mining men ever assembled in the United States. The occasion is an important one, as it is expected that the next session of Congress will pass a bill revising the mineral land laws. Many important papers are to be presented.

Suggested Standards for Pattern Parts

Certain standards for pattern parts were advocated by W. W. Carlson, Kansas State Agricultural College, Manhattan, Kan., in a paper presented at the meeting of the American Foundrymen's Association, Cleveland, Sept. 14. Among other standards recommended is a system of colors for parts of patterns to show the finish of the various surfaces of the casting. Thus, if a casting is molded with the surfaces that are to be



D	L	D	L
3/8"	3/8"	1 7/8"	1 1/2"
1/2"	3/8"	2"	1 1/2"
5/8"	3/8"	2 1/8"	1 1/2"
3/4"	7/8"	2 1/4"	1 1/2"
7/8"	7/8"	2 3/8"	1 1/2"
1"	3/8"	2 1/2"	1 1/2"
1 1/8"	1 1/8"	2 5/8"	1 1/2"
1 1/4"	1 1/8"	2 3/4"	1 1/2"
1 3/8"	1 1/8"	2 7/8"	1 1/2"
1 1/2"	1 1/4"	3"	1 1/2"
1 5/8"	1 1/4"	3 1/8"	1 1/2"
1 3/4"	1 1/4"	3 1/4"	1 1/2"

Suggested Standard for Core Prints

machined at the bottom of the mold, there will be less likelihood of these surfaces being imperfect due to slag, dirt and other impurities, than if they were at the top. Coloring the pattern to indicate which are machined and which are rough surfaces will often enable the molder to so bed his patterns as to bring the machined surface at the bottom. The following schedule of colors is recommended.

Rough casting	Yellow
Machined surfaces	Red
Core prints	Black
Pattern joints	Natural shellac
Pattern boards	Black

These colors, the author says, may not be ideal but they fill the purpose admirably. In a modified form they are already in use by steel manufacturers, and so he feels it would be an easy matter to settle on some one plan that would soon become generally used throughout the country. The objection that is sometimes put forth against color schemes is, he said, that they add to the expense, yet every pattern worthy of the name should be properly coated to protect it. The expense of this coating is, he added, a small percentage of the total cost of the pattern; the additional expense of the added colors is slight and disappears when the advantages gained are considered.

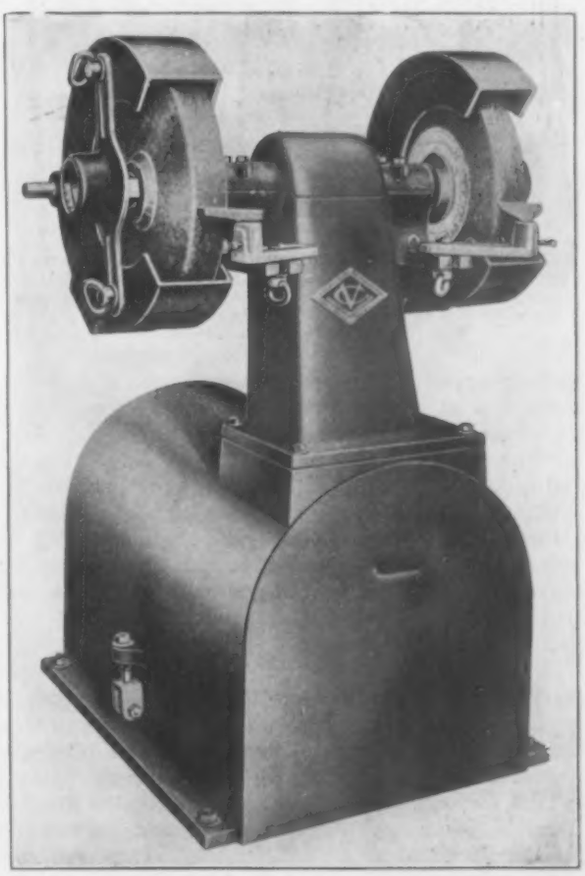
Another suggested system of standards is that of core prints. The accompanying illustration shows the system adopted in the shops of the Kansas State College. As will be noted, the vertical core prints have different tapers for the upper and lower ends. This taper is found to be sufficient but not excessive, and it is believed it will fit all average conditions. The shanks are all turned to the same diameters so that certain prints can be removed and others substituted of whatever size is desired. The author enumerates commendable points of the prints as follows: (1) There is a saving of time in making patterns by having core prints on hand. (2) There is a decrease in expense due to the fact that apprentice boys or low-wage help can be used instead of the more highly paid pattern-makers. (3) Ease of changing the size of core prints on a pattern for pulleys and in various places where varying holes are required, is of value. (4) Since the tapers on the vertical prints are the same it is much easier and surer to secure properly fitted cores in the core prints. (5) As will be noted, the horizontal print has an increased diameter next to the pattern to aid in avoiding crushing the sand next to the mold when the core is put in place. (6) There results an increased rate of production and satisfaction to the workman by having definite written instructions for the men to follow.

The accompanying standard lists prints only up to 3¼ in. in diameter with a length of 1½ in. This length prevails up to 4 in., where the length changes to 2 in., which continues to 6 in. diameter. At 6 in. the length becomes 3 in. and at 8 in. the length changes to 4 in.

Grinding Machine with Inclosed Motor

A line of grinding and buffing machines has been brought out by the Valley City Machine Works, Grand Rapids, Mich., with the motor inclosed in the base. They are of the motor-driven, self-contained type, in which the power is transmitted by a belt connection. Thus, it is emphasized, it is possible to use any motor of the proper power, irrespective of its speed or the nature of the current available. The base is designed to carry the various sizes of the company's grinding heads, the wheels in the machine illustrated being 18 in. in diameter, while the base houses a 5-hp. motor.

In the machine the motor is placed on a pivoted base at right angles to the grinding spindle, the connection being made by a quarter-turn belt. It is explained that this arrangement keeps the motor free from dirt and grit and at the same time the shocks are cushioned or absorbed without danger. The tension of the driving belt can be varied from time to time by manipulating the adjustment screw at the base of the machine.



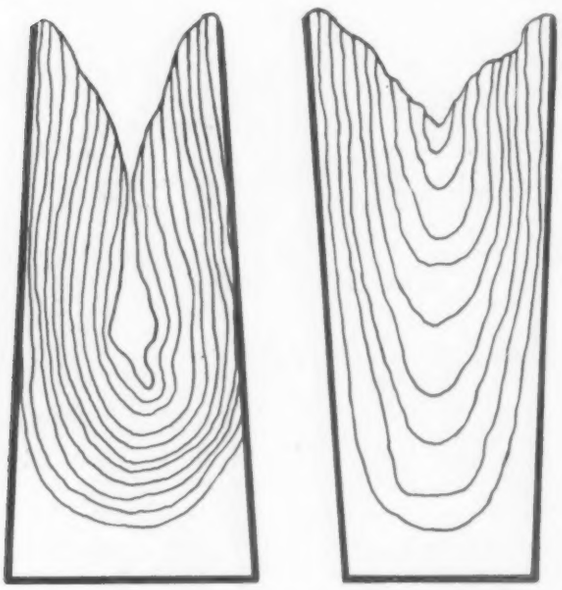
A New Self-Contained Grinding and Buffing Machine in Which the Driving Motor Is Mounted on an Inclosed Pivoted Base and Transmits Power Through a Quarter-Turn Belt

The Production of Sound Steel Ingots

Some Results of Modern Practice Using the Large End Up with Hot Tops —Top and Bottom Pouring Discussed

CONTRIBUTED

THE physical properties of wrought steel depend in part on its chemical composition and in part on the mechanical and thermal treatment which it has received. The ingot is the phase in its manufacture in which it is prepared for physical treatment. The casting of sound ingots, simple though it may be imagined to be by those whose work begins with the finished bar or sheet, is a process literally as complex as the microscopic structure of the steel itself. In modern steelworks practice the chemical composition of the metal can be identified and its heat treatment controlled with considerable precision and the effect can be followed closely by microscopical and other methods. The production of the ingot, on the contrary, is subject to many influences to which quantitative determinations cannot be applied in practice, and it remains largely an empirical process.



Figs. 1 and 2 Show the General Outlines of the Successive Layers of Metals in Ingots as Ordinarily Cast in Tapered Molds

The faults which occur in the production of the ingot do not necessarily disappear in its subsequent treatment. On the contrary, many of them may accompany the material throughout the whole of its manufacture and become either the reason for its rejection and consequent waste of labor or the hidden cause of disaster in use.

THE GROWTH OF AN INGOT

What occurs in the solidification of an ingot is generally accepted, but the actual form which the conditions of its growth compel its interior to take is not so generally recognized. The dominant fact is that the layers which set successively are roughly parallel to the walls of the mold, and preserve a similar inclination to each other. They are not accurately parallel, because the rate of cooling varies in different parts of the ingot. The sides of the outer shell which set first, for instance, contract and withdraw themselves from direct contact with the walls of the molds, thus reducing their cooling effects, while the base remains constantly in contact with the bottom of the mold. This differential value of the cooling surfaces is appreciable, but is quite insufficient to prevent the inclination of the walls from controlling that of successive layers. This fact has recently been pointed out by Harry Brearly *Journal* of the West of Scotland Iron and Steel Institute, March, 1916), and is both illustrated by him with reference to ingots which were emptied or bled at various stages of solidification, and confirmed by a series of observations on the solidification of sterine, in which he was able to study the phenomena of setting more closely and continuously than was practicable with metal.

Figs. 1 and 2 show the general outlines of the successive layers by which ingots as ordinarily cast grow in taper molds. As is seen in Fig. 1, an ingot cast in a taper mold with its small end up forms ultimately a closed solid with a liquid in its interior. This liquid metal will shrink on cooling, leaving a pipe or cavity; and the cooling process, being there at its lowest, will favor the segregation or separate crystallization of impurities along the central axis, while the solid closure of the cavity at the top will prevent the segregates from rising into the head of the ingot. A similar cavity is seen in both figures at the upper part of the ingot, and unsoundness through this cavity is avoided in practice by discarding the upper part of the ingot in which it is visible. Fig. 1 shows, however, that no such precaution will remove the unsoundness due to the lower pipe.

In both types of ingots the actual depth of the upper pipe will vary with the size of the ingot, the nature of the steel, and other circumstances. But in those cast with the large end up, drawing the shrinkage of metal from a larger cross-section, the depth of the pipe is less, while the longer time for which the metal remains liquid in the upper part permits a larger part of the segregates to rise into the head.

These facts are the more important because the convenience of stripping the molds without waiting until the ingots are sufficiently set to be handled safely causes a large proportion of ingots to be cast with the small end up.

TOP AND BOTTOM POURING

The conditions of casting ingots differ also according as the metal is brought up into the mold from the top or the bottom. In top casting the mold can be, and usually is, filled more quickly than in bottom casting, where the liquid metal has to rise against its own head. As against this advantage, which is more material to quantity than to quality of output, bottom casting has advantages of its own. If the metal is introduced quite centrally and vertically through the base, it flows more evenly over the surface of the mold than if it cast from the top, giving a cleaner skin and less chance of the premature solidification of splashes. The immediate contact of the metal with the sides and its relatively

slow rise give a quicker setting and a thicker solid crust, reducing in this way the volume of liquid metal and the size of the pipe which its shrinkage will cause.

In a usual form of bottom casting the top of the mold is closed except for a vent hole; and the thick crust which forms through contact with the top serves to seal the ingot from the air and to give a better chance that the cavities which are left will be unoxidized and will weld up under the subsequent treatment.

In some practice the mold in bottom casting is left open at the bottom, and is placed over a hole in a thin runner-brick through which the metal is introduced. If the mold is not placed centrally over the hole, or if the hole is chipped or partly melted, the metal is not delivered symmetrically into the mold, and under the head which is behind it may splash against the sides and otherwise set up lines of weakness in the ingot.

MODERN PRACTICE

Leaving out the methods which have been and are used for closing cavities under pressure, which involves a costly plant and considerable revision of existing arrangement, the best known method of increasing the soundness of ingots and reducing the percentage which has to be scrapped is that of Sir Robert Hadfield. It has long been recognized that if the metal is kept liquid in the top of the mold, the pipe is fed and filled up to within a short distance below the final level of the liquid, while the segregates float up and are found in the head. In making small crucible cast ingots, for instance, the upper part of the mold is lined with a white-hot fire-clay sleeve or nozzle, which stops the piping, though not the contraction cracks.

A more vigorous method has been tried by covering the top of the metal with charcoal and burning it with a blast of air; but while this method gives the necessary heat and keeps the metal extremely liquid, it is apt to carbonize the upper layers of the metal and to introduce serious variations into the composition of the ingot. Krupp has covered the top of the ingot with molten slag. The solution of the problem which Hadfield has introduced is to use the charcoal and blast, but first to cover the metal with molten slag; thus providing whatever extra heat is wanted for keeping the metal liquid, while interposing the slag to prevent carbonization of the metal.

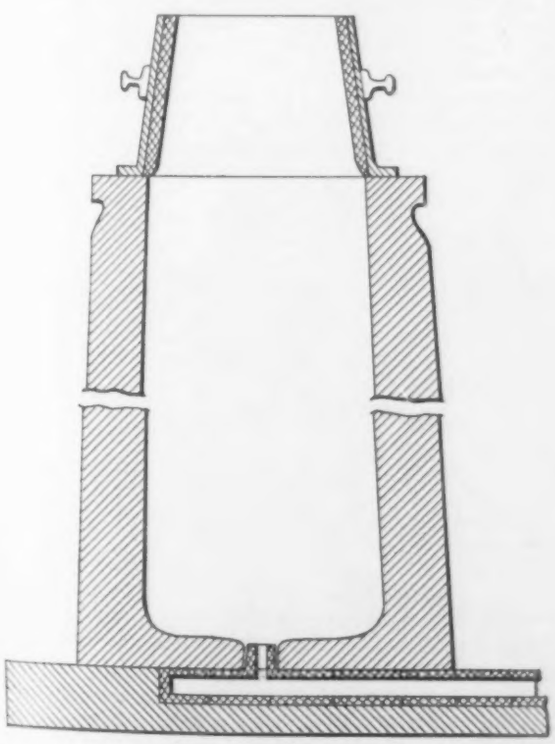
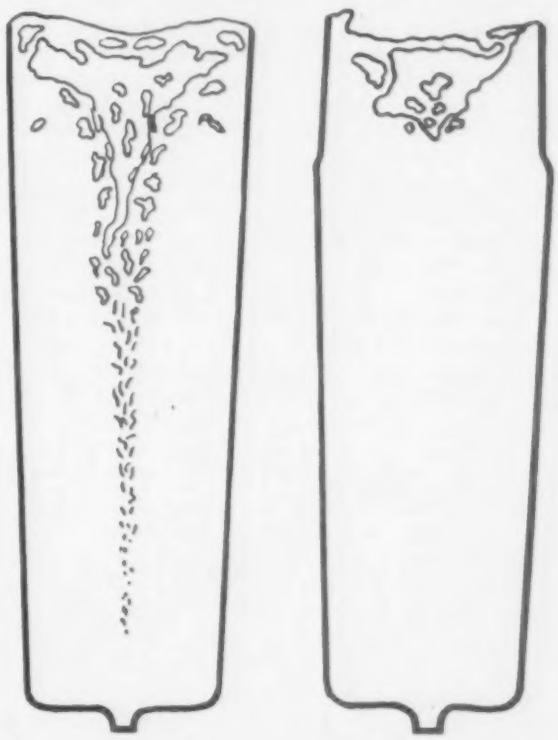


Fig. 3—Cross-Section of Ingot Mold with Hot Top and Large End Up, Showing Method of Introducing Steel in Bottom Pouring. This procedure is more universal now, it is claimed



The Right-Hand Drawing (Fig. 5) Represents a Section of a 12-In. Square Ingot Intended for Conversion Into Shell Billets Poured from the Bottom in a Large End Up Ingot with a Hot Top. Fig. 4 (Left) represents an ingot as usually cast

The use, however, of a separate blast on each mold introduces a complication to which many works would be averse, and obviously the method must require some care to prevent the charcoal from coming in contact with the steel which first solidified around the top of the mold and forming with it a liquid cast iron which would flow down into the ingot, which in the absence of precaution could readily happen when the level of the slag falls through shrinkage of the liquid steel.

Successful though the method has been in the works in which it has been used, an alternative would be preferred by many steelmakers in which no additional material and no extraneous heat is required. Such an alternative is now being worked in the following manner: The molds are used large end up and the metal is cast from the bottom, which is solid (Fig. 3), having a central aperture fitted with a renewable fire-clay lining which stands over the hole in the runner-brick. This arrangement insures the metal being delivered truly up the axis of the ingot and avoids the troubles which ordinarily arise through inevitable defects in the runner-brick hole. By the use of a vacuum cleaner just before casting, any dirt which may have fallen into the mold is removed, and the ingots are obtained with a clean skin from the very bottom.

The top of the mold is covered with a cast-iron head with inclined sides, furnished with internal projections which serve to hold a thin refractory lining and the heat which this head catches and reflects on to the surface of the metal keeps the upper part of the metal liquid for feeding the body of the

ingot as it shrinks until the segregates have passed up into the head and the ingot has set solid.

This process, which is free from patent rights, involves little or no alteration in existing methods of working. It is used in more than one works in Sheffield, England, and has been in constant operation for many years in at least one large steel plant in America, both for small and very large ingots. Sections taken from time to time have invariably shown an ingot sound up to the head, as is seen in Fig. 4, which reproduces the section of a 12-in. square ingot intended for conversion into shell billets, and may be compared with Fig. 5, showing an ingot cast in the ordinary way. For the last eight months the same size billets made by this process have been adopted for rifle-barrel blanks and supplied for this purpose, with the rejection of only the head, which only weighs 10 per cent plus or minus 1 per cent of the whole ingot. The presence of any unsoundness or segregate in any blank is shown up at once on boring and the observations on occasional sections have been confirmed by the fact that no rifle-barrel blank has been found to be unsound.

YIELD OF INGOTS

The improvements in soundness of ingots which these modern processes have now made is therefore shown not merely by their conformity with the requirements of the physical phenomena of casting, but by prolonged and continuous experience. But the proportion of the upper part of the ingot which is scrapped in ordinary practice for many purposes, including shells, remains for the most part unaltered. Under this practice a minimum of 20 per cent is discarded from top-cast ingots and 25 per cent from bottom-cast ingots, and is much more than is required to disclose a sound top in the part which is left for use. But even so, unsoundness may still possibly exist below the solid top. Considering the small control which the usual methods exercise over the inlet of metal in bottom-cast ingots and over the loss of heat and formation of pipes in ingots of both kinds, the practice as applied to them has not been needlessly severe.

As much, however, cannot be said of the application of this practice to ingots made under the modern processes which have been described. Taking, for instance, the figures of the last process, it is clear that after discarding 15 per cent from the top of such ingots the whole of the suspicious region will have been removed, with an ample margin. No part of the remainder will be more likely to be unsound than any other part of the ingot; no further security will be gained by discarding a larger quantity and the ingot so cropped will be far more likely to be sound than the ingots of ordinary manufacture which have been cropped in accordance with the present ordinary practice. G. S.

Cast-Steel Shells Successfully Made Here

Cast-steel shells are reported as being made in this country successfully and on a large scale by one of the large steel-casting companies of the Central West. The monthly output is said to be 3600 tons. The surprising fact is that after casting they are not forged, but are machined only. They are cast hollow, of basic steel, containing 0.60 to 0.70 per cent carbon. After the excess metal as heads is removed, ¾ in. from each shell is machined from the outside and ½ in. from the inside. They are reported as sound and solid and eminently satisfactory. Considerable money is said to have been spent before it was learned just how to make them. They are all 6 and 8 in. shells, and are sent to a Canadian locomotive works, where they are machined.

A New Distant Recording Thermometer

A thermometer capable of recording temperatures at some distance from the point at which they are measured, has been placed on the market by the Brown Instrument Company, Philadelphia, Pa. The instrument, which is designed for a range of 0 to 800 deg. Fahr. or 0 to 425 deg. C., operates on the principle of the expansion of a gas with changes in temperature.

In This Recently Developed Recording Thermometer the Expansion of Nitrogen Gas in the Cylinder Transmits Pressure Through the Tube to a Helical Spring Which Expands and Actuates the Recording Arm

A number of new features have to do with the revolution and holding of the chart.

A copper cylinder containing nitrogen gas under pressure is employed to measure the temperature. A number of different types of gas containers can be furnished having either threaded connections for insertion in mains and pipes, or coated with lead to withstand the attacks of chemicals and acids. The change in the volume of nitrogen gas in the copper cylinder, due to changes in temperature, is transmitted through a small copper tube protected by flexible steel tubing. This tube can be supplied in lengths of 100 ft. if desired, thus making it possible for the recording gage to be placed as far as that from the point where the temperature is being measured and enabling the instrument to be used in numerous processes where a constant record of the temperature on a chart is desired.

A flat helical spring resembling very closely that used in pressure gages forms the basis of the recording mechanism. It is directly connected to a recording arm which marks on the record chart and expands in proportion to the pressure exerted by the expansion of the gas in the copper cylinder, this pressure being transmitted through the small copper tube.

The chart is revolved by a clock movement mounted directly on the front plate that supports the chart, this arrangement being relied upon to insure alignment of the clock and the chart plate. The chart is held in position by clips attached to the door and swinging away from the chart automatically when the door is opened. In this way the chart can be readily replaced without interference, especially as the opening of the door brings an automatic pen-raising device into play and keeps the pen clear of the chart until the door is closed again, when the pen is automatically released.

An indicating form of instrument for the same ranges of temperature is made where the necessity does not exist for having a permanent record.

A research on cobalt and cobalt alloys, conducted at Queens University, Kingston, Ontario, Canada, for the mines branch of the Canadian Government, has been published under the title "Magnetic Properties of Cobalt and of Fe_2Co, by Herbert T. Kalmus and K. B. Blake.

A QUENCHING MACHINE

Continuous Hardening, Pickling, Cleaning and Drying Apparatus—Used for Shells

A special machine that does the work in a munitions plant for which a gang of eight to ten men was formerly required has been developed by the U. S. Electro Galvanizing Company, 1 Park Avenue, Brooklyn, N. Y. It is an apparatus capable, say, of washing articles in a number of different solutions and then drying them. The machine is operated by one or two men and does the work, it is pointed out, of a battery of tumbling barrels.

The apparatus, which is continuous in operation, consists of a receiving bucket suspended in a tank of water and a number of drums revolving in tanks containing different solutions and a drying drum. These drums revolve at a speed of 10 r.p.m. and are installed on an incline instead of being perfectly horizontal. The material is thus made to advance as the apparatus revolves. A great variety of adjustments and combinations are possible. For example, the speed of travel of the cartridge shells through the machine can be governed by varying the speed of the machine, the inclination or the width of the pick-up pockets or by various combinations of all three.

In operation the shells come from the annealing oven at a red heat and are carried down a slide from the oven in trays that are tilted at the bottom of their travel to empty the shells into the receiving bucket of the washing machine, which is a square perforated receptacle with a chute at one end. This bucket in its receiving position is immersed in a tank of water, and as the shells are emptied from the trays they strike the water, which hardens them first.

One end of the receiving bucket is then raised, the other containing the chute remaining stationary. This causes the shells to run into a cylinder where the water is drained off and they next pass into a perforated drum revolving in a tank containing a pickling solution. Here they remain for about 4 to 5 min., as it takes that period for them to travel from one end of the cylinder to the other where they fall into a pick-up pocket.

This pick-up pocket carries them, a few at a time at each revolution of the machine, from the pickling drum to a perforated cylinder where they are drained. They next advance into a drum revolving in clear water where the pickle is thoroughly rinsed off, approximately 1 min. being required. The shells are again picked up and go to another draining cylinder from where they pass into a perforated drum revolving in a soapy solution where they remain about 4 or 5 min. Pick-up pockets again take the shells into another draining cylinder and into a drum revolving in clear water. From here they pass into another draining cylinder and then into the drying drum, which consists of an inner perforated cylinder that contains the shells and an outer cylinder supported by legs. The latter is a sort of hood or container for the heat and has three openings in its lower part through which the hot air is introduced, while an opening at the top is provided for the air to pass off.

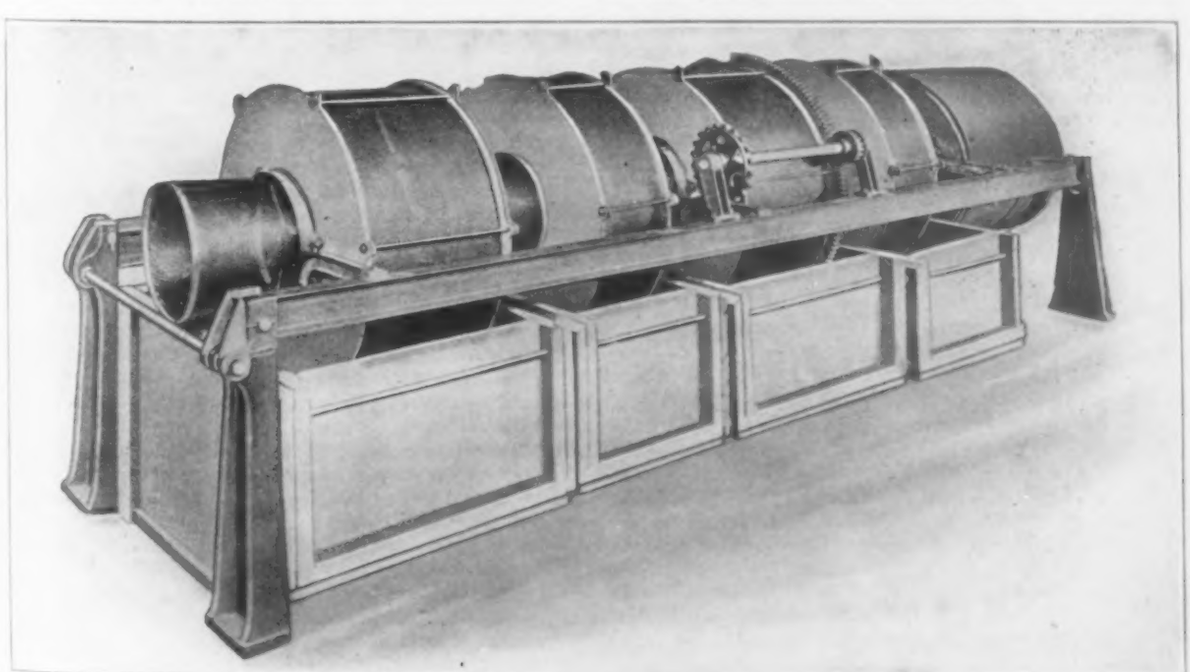
Vanadium and Tungsten from Peru

A partial indication of the growing mineral wealth of Peru was given by the President of Peru in his recent annual message to Congress. Some of the data of the production for 1914 and 1915 in metric tons is as follows:

	1914		1915	
Material	Tons	Value	Tons	Value
Vanadium ore, 45 per cent	14	$3,163	3,145	$682,610
Tungsten ore, 65 per cent	196	96,184	371	350,358
Molybdenum ore, 82 per cent	...	.....	274	6,983
Antimony ore, 45 per cent	...	.....	406	17,782
Lead	3,048	142,486	2,750	125,555
Copper	27,090	7,447,419	34,319	11,834,373

The large advance in 1915 in vanadium and tungsten production, as well as the inception of molybdenum and antimony mining, are striking.

The marketing of engineering ability is to be the subject of an address by C. Francis Harding, professor of electrical engineering, Purdue University, to be delivered at the City Club, Chicago, Oct. 6, at a booster dinner, so called, to be given by the American Association of Engineers in its campaign for membership. Other speakers on the program are John Ericson, city engineer, Chicago; W. H. Finley, chief engineer Chicago & Northwestern Railroad, and Isham Randolph, consulting hydraulic engineer, Chicago.



A Combination Machine Which Receives Red Hot Cartridge Shells from the Annealing Oven at One End and After Automatically Quenching, Pickling, Cleaning and Drying Them Discharges Them Ready for the Next Operation at the Other End

The Determination of Foundry Costs*

An Efficient Production System and Adequate Cost Accounting Essential to Make the Proper Prices to Insure Profits

BY CLINTON H. SCOVELL

An adequate production scheme is one of the essentials for efficient foundry management. It is also the framework for the cost accounting.

Upon receipt of an order for castings, at least three copies of the production order can be used effectively. One should remain in the production department, filed by customers or manufacturing classification, and two copies should go forward to the foundry foreman, one for his file and one as an order for patterns. A summary of these orders is kept by the production clerk, classified by customers, and if desirable for production purposes, according to weight of castings or grade of metal. A daily analysis of this summary is made by the production clerk and foundry foreman, and the production for succeeding days determined. Postings are made to this record, crediting the good castings made each day and leaving as a balance the number of castings for each pattern yet to be made.

When new patterns are received at the foundry the gross weight of castings to be made from these patterns is calculated. By maintaining the record the production ahead of the plant can be closely estimated.

Production orders as issued to the foundry should be given serial numbers. These order numbers can be so arranged as to indicate a customer, a class of work, a pattern, or, if desirable, all three.

THE DISTRIBUTION OF LABOR CHARGES

The labor cost will be sharply divided between direct and indirect charges. Even if the direct charges are not further subdivided, the total payroll should be separated into cupola labor, molding, core making, cleaning, pattern work and carpenter shop. In most cases there should be a subdivision of molding and core-making labor which will show the time consumed by molders and core makers against individual production orders. On large work there should be a similar division of cleaning also.

All indirect labor (except that connected with the molding, core making and possibly cleaning departments) should be charged to appropriate burden centers and subsequently distributed to job cost cards on the basis of pounds of good castings made. The indirect labor associated with molding and core making will be charged from the labor distribution to the molding or core making burden centers, and applied to costs through the hourly burden rate of these centers.

MATERIAL COSTS

The material charged to the cupola is the principal cost of melted metal, although the total cost of metal is composed of fixed charges on the investment in cupola equipment and raw material inventories, cupola repairs and the labor of the cupola gang.

A perpetual inventory should be maintained for all materials and supplies. This does not necessarily mean that detailed stores cards should be maintained, covering all items of supplies. But separate accounts should be kept (including freight as well as purchase price and unloading costs when kept separate) for such important items as pig iron, scrap, coke, molding sand, etc. General supplies may well be grouped in a storeroom, for which one person should be responsible. The balances on hand may be checked individually as convenient. If various sections of the inventory are checked at regular intervals, an accurate record can be maintained, so that it is possible to prepare a reliable statement of loss and gain at the end of each period without taking a physical inventory.

It is highly advisable that such supplies as nails, gaggers, etc., be kept under stores control. Large savings have been effected by requiring the foremen of the molding and core-making departments to issue requisitions for this class of supplies, which are a charge to burden in the respective departments.

THE DISTRIBUTION OF BURDEN

The first burden charge to each department is for rent. If the plant is rented, the rent chargeable to each department can be determined easily by apportioning the total rental paid according to the relative areas of the different departments. Where the plant is owned, the expense corresponding to rent consists of interest and taxes on the land, and interest, taxes, insurance, depreciation and repairs, and possibly heat and light on the buildings. The sum of these charges determined for each building in the plant, divided by the available floor space in each, gives a square foot factor which can be used to distribute the rent charges to departments.

The burden charges on the equipment in the several departments will vary because of the varying cost of the equipment, affecting interest, tax and insurance charges, and because the nature of the operations performed affects the depreciation. Charges of these various kinds are therefore based on the value and kind of equipment in each department. The sum of the rent and equipment charges are fixed whether any manufacturing operations are carried on or not.

The next charges are for power and for repairs to keep the factory in good operating condition. The power plant should be considered as an individual unit, and the cost of generating steam and power carefully determined. The cost of operating the power plant will include, beside fixed charges, such items as labor, repairs, coal, water and supplies. Having determined the cost of power, each department using power should be charged with its correct proportion of this cost. If it is not feasible to record the power used by each department, the consumption should be estimated as closely as possible. Multiplying the number of horsepower-hours used by the cost per hour the power charges against each department is determined.

In a large plant the repair department should also be treated separately, and its burden known. The original estimates on the cost of repairs in departments may be made from repair department records, or from a knowledge of the repair materials purchased, the payroll in this department and its share of the burden. When work is done for the productive departments such work should be charged to them in the same manner as it would be by an outside company. When the charges are accumulated on the individual repair job they check the estimate in each department.

The labor cost for foremen will be part of the burden of molding and core making, and of the pattern shop and carpenter shop if they are large enough to have charges of this kind. Cleaning labor may all be thrown together and assessed, with other general charges as a cost per hundred pounds on all the work done, but if the foundry is handling large castings which individually take several hours to be cleaned or chipped, these costs should be charged separately just as much as molding or core making labor, and in such cases the labor of foremen will be charged to burden as in other departments.

Some foundry executives may question the importance of dividing overhead or burden as above described. They may believe that average costs for metal, molding, core making, cleaning, etc., are all that is necessary, and where the product is uniform a fairly

*Abstract of a paper read at the meeting of the American Foundrymen's Association, Cleveland, Sept. 11-15, 1916. Adapted from the author's "Cost Accounting and Burden Application," in course of publication by D. Appleton & Co., New York.

good control of foundry operations may be secured in this way. However, labor costs vary widely for molding and core making on castings of different weights and different shapes. It is the difference in labor cost that attracts attention, but it takes only a little analysis to show that there is a burden on molding separate from that on core making. If an accurate distinction between the cost of light and heavy castings is desired it is essential to separate the burden costs as well as the labor costs, and charge these burdens in proportion to the work actually done in the respective departments and not as a flat average over the entire output.

THE ELEMENTS OF COST OF A CASTING

The elements of cost in a casting are the cost of metal at the spout, and the costs of molding, core making and cleaning. There is overhead or burden to be reckoned in connection with all these costs, and there are certain general expenses, as for power, heat and light, and supervision, that must be considered and spread in an appropriate way over the product. These costs will be accumulated on the job cards for individual production orders. It is a question of discretion as to just what a production order should cover. In most foundries it will stand for a class of product, or for an individual customer's requirements, but in some instances, as previously noted, individual castings will be made on separate production orders.

A job card should provide for the hours and amount of core making and molding labor, the number of pounds of good and defective castings made and a memorandum as to the loss through returns and allowances. The hours and amount of core making and molding labor will be posted from daily labor tickets, and the weight of castings, both good and defective, from the daily production reports. A memorandum of loss by returns and allowances will be obtained from the accounting department as credits are issued.

The burden of the core making and molding departments will be applied to the corresponding labor charges, preferably on the basis of the productive hours already charged.

If the work is large, cleaning labor and burden will appear as separate items, on the individual cards. Any charges for patterns, or machine work that may be done strictly as a foundry cost, will be accumulated on a separate cost card, but should be included on the cost-of-casting card under the heading of "Other Charges."

The cost of metal at the spout as accumulated in the account set up for this purpose is to be distributed to the job cards in proportion to castings made. Some managements will desire to have the material cost of metal and the cupola operating or conversion cost separately on the production orders, but if this division is made it seems logical to go a step further and show cupola material, labor and burden all separately. The cost of the metal and the cupola operating costs are separate, of course, on the cupola report.

Just what course is adopted in this respect will depend on the view taken in regard to defective castings, and as it cannot always be known whether castings are defective as soon as they are broken out of the sand, it seems wiser to distribute all of the cupola costs to all of the castings made. Those that prove defective have a scrap value. If this is regarded as equal to the average cost of the cupola charge the cost of the defective castings will be merely the labor and burden (and conversion cost, if stated separately) which has been incurred in their making.

The same result can be secured by distributing the cost of metal on the basis of good castings made, and distributing the cupola labor, burden and fuel on the total weight of castings made, both good and defective. A total will be obtained as to both gross weight and amount, from which the weight only of defective castings will be deducted, if the metal cost is charged on the basis of good castings. If the metal cost is on the basis of gross weight, both the weight and value of scrap will be deducted. According to either plan, this will leave the net weight of good castings, and the total cost of both good and defective, less the scrap value of the defective castings.

To the cost, as above determined, general burden should be applied, representing miscellaneous foundry expenses, at a rate per hundred pounds. The main elements of burden in a foundry are to be recognized and distributed as charges on land and buildings, and for power and repairs, but after the best possible analysis of charges of this character, and their distribution to cupola, and to the departments of molding, core making, cleaning, etc., some general charges will remain for such items as general supervision, clerical labor, shipping, delivery and the costs of defective castings returned from customers (less scrap value). If the product is fairly uniform and rather small, all the costs of cleaning can be conveniently thrown in the general burden on a pound basis.

The expense for flasks and patterns, including repairs as well as fixed charges, is logically part of the molding burden, but this is sometimes thrown into general burden.

ALLOCATING THE COST OF PATTERNS

The policy of different foundries will naturally vary in respect to the cost of new paterns. In a jobbing foundry where the customers own the patterns this factor will not have to be considered, but in a foundry making for its own machine shop it will be considered part of the foundry cost. The general upkeep of patterns may fairly be included in molding burden, but the cost of new patterns should be accumulated on individual pattern orders, even if the final charge is to an expense account.

Patterns are an asset to a certain extent, and if a foundry is rapidly increasing its line it is logical to increase the asset in patterns, but after a line has been fully established an increase in the assets on account of patterns should be made very cautiously, and practically all expense of this kind charged as maintenance.

SUMMARIZING THE RECORDS

To complete an adequate cost and accounting plan for a foundry, provision should be made for summarizing various records. The distribution of labor and materials and also the development of burden has already been explained.

The total cost of the cupola will be distributed to individual production orders or job cards, according to one of the two plans outlined, and the total will be a credit to the cupola account and a charge to individual orders. A summary of the production orders in respect to labor and departmental burden will provide credits to the respective labor and burden accounts, and the total cost of the finished castings will be charged to an account called "Cost of Goods Sold," by individual customers if immediately shipped, or be transferred to a machine shop inventory. The foundry cost cards should provide for a convenient posting of shipments (weight and cost value), and to carry forward the remaining inventory to the operations of the next period. A few foundries maintain a stock of clean castings that have not been machined, but this is almost uniformly for the benefit of the machine shop rather than the foundry, and the value of such raw castings is much better transferred to the raw material inventory in the machine shop, rather than carried as inventory of finished work in the foundry.

On continuous jobs, such as work for a regular customer, or on any special work that is not finished in the month in which it is started, there will be material, labor and burden costs in the succeeding period, in addition to those brought forward from the previous period. The balances, both weights and cost values, determined at the end of each period (month or four weeks) are an inventory of work-in-process, and the total of the balances on the job cards should agree with the controlling account in the general ledger. This bookkeeping agreement should be established as a matter of course every period, and a physical inventory should be taken and compared with the job cards from time to time as may be convenient, so that the management may be sure that the values and the weights are actually on hand.

Upon each cost card there should be provision for such information as the selling price, cost of goods sold, gross profits, loss on returns and allowances, and net profit. These items should be proved, by means of summaries, with the controlling accounts in the ledger.

BRITISH MADE PIPE

American Superiority in Manufacturing, Packing and Delivering Not Admitted

An answer has been made to the article appearing first in the *Ironmonger*, of London, and later in THE IRON AGE, of August 24, giving the palm for excellence of product and method of packing for shipment to American-made pipe over pipe manufactured in Great Britain or Canada. The original communication was made by Percy G. Donald, who was engaged in behalf of the British Government in buying material for a water pipe line in Egypt. Owing to the prominence given Mr. Donald's severe criticism, William Stewart, Stewarts & Lloyds, Ltd., tube manufacturers, Glasgow, Scotland, has sent to THE IRON AGE a copy of that company's reply to the arraignment. Substantially in full it is as follows:

PACKING FOR EXPORT

"The specification issued to British manufacturers called for the threads of the pipes to be protected with old nail bags. This method of protection is illustrated in Mr. Donald's article (Fig. 1), and is described as the 'usual method of packing British water pipe.' That description is altogether misleading. The usual method of protecting the threads of tubes of the sizes dealt with in Mr. Donald's article is by means of a wrought-iron ring screwed on the uncoupled end. This ring may consist of a half-coupling, or a forged ring made specially for the purpose.

"Mr. Donald refers to this protection as an 'alternative' method adopted by British manufacturers, but his statement that it is only supplied at an extra charge is incorrect. Our practice, and we believe the practice of all other British makers, is to include the protection ring in the price per foot of the tube. It is not clear from Mr. Donald's article what proportions of the British tubes were supplied protected respectively with old nail bags and with rings, but the article gives the impression that the majority of the pipes were protected at the ends with old nail bags. This, so far as our supplies were concerned, was not the case.

"As to the illustration of a typical protector found on American pipes, it is not claimed that this is the style of protecting ring found on *all* American pipes. It is not the usual American protection. In this connection we refer to the description given at p. 90 of the National Tube Company's pocket catalogue, which reads: 'Solid tapped rings or split couplings will be provided as thread protectors on all sizes, 4 in. in diameter or larger.'

PIPE COUPLINGS AND LENGTH OF TUBES

"Mr. Donald's references to pipe couplings are contradictory. He states: 'The American socket has the inside slightly bevelled before the thread starts,' and 'in the American pipe the socket is invariably recessed.' If American sockets are invariably recessed the reference to bevelling is meaningless. If they are bevelled the reference to recessing is misleading.

"It is stated that the British pipes were sent out with the threads quite dry both at the socket and the spigot end. Our practice is to oil the threads of the couplers and the tubes before despatch.

"The length of the tubes made by British manufacturers is determined by many factors, including the length of the railway trucks in which the material to make the tubes reaches the tube-maker and in which the tubes are despatched from the tube-maker's works, the head-room in their customer's warehouses, and facilities for handling. We do not think there is much in this point, as, from our own experience, there is not much difference between the lengths of British and American pipes of the sizes in question.

"The greater number of joints per day which it was possible for Mr. Donald to make with American pipe than with British must have been due more to the finer thread on the British pipe than to any difference in the length of the tubes themselves.

SCREW THREADS

"There are many considerations determining the number of threads per inch with which tubes should be screwed, and there are good arguments in support of both the American practice of eight threads per inch and the British practice of eleven threads per inch. The British Engineering Standards Committee went very carefully into this matter, and decided that the balance of advantage for all purposes of pipe threads lay with eleven threads per inch for pipes 1 in. to 6 in. nominal bore.

"At the instigation of American and French engineers an international commission met four or five times in Paris in order to standardize pipe screw threads and form an international standard. At these meetings the advantages of both practices were again gone into thoroughly, and at the last meeting it was decided to recommend the adoption of the British practice, viz., eleven threads per inch, and this was done with the full concurrence of the Americans. Among other reasons, the fact that in screwing eight threads to the inch much of the metal of the pipe was cut away, thereby nullifying any possible advantage of a heavier pipe, had considerable influence.

THE WATER TEST

"More care is required to make a satisfactory joint with pipes screwed eleven threads per inch than with pipes screwed eight threads per inch, and lack of experience in laying the pipes probably accounts for the greater number of British joints found to be leaking when water was pumped through.

"That a perfectly satisfactory joint can be made on pipes screwed eleven threads per inch with tubes screwed taper and sockets screwed parallel is beyond question. Such joints have been in satisfactory use for comparatively high pressures for very many years, and are standard practice for gas and water purposes, and also for moderate steam pressures. For oil-line work or high-pressure steam, British practice is to screw the tubes taper and the sockets a corresponding taper.

THE TERM BRITISH STANDARD

"The term 'British Standard' refers exclusively to British Standard threads, and is not used, either by tube manufacturers or by consumers, in referring to sizes or thicknesses. Mr. Donald has failed to appreciate the difference between British Standard for pipe threads and British Standard sizes and thicknesses.

"There obviously cannot be any variation in screwing standards, and all makers work to standard gauges in screwing their tubes. As the different thicknesses of tubes for gas, water and steam are all screwed to the same standard, it follows that the inside diameter of the tubes can only be nominal and must vary with the thickness.

"Mr. Donald states that the Admiralty, the War Office, the railway companies, and the shipbuilders, although represented on the British Standards Committee on Screw Threads, set up their own special standards when asking for quotations. This is not the case. These bodies may specify different thicknesses according to the various requirements, but they all adhere to British Standard screwing.

"It is alleged that hardly two manufacturers in Great Britain agree on the weight per foot of any size of tube. This is a matter of little consequence. Tube-makers publish their standard thicknesses and weights for the different qualities of tubes they make, and if there is any difference between makers' standards, users can select the thickness that best suits their purpose.

STANDARDIZATION IN THE UNITED STATES

"Mr. Donald alleges that American manufacturers can produce tubes of a higher quality and a greater weight at prices considerably below those of the British manufacturers, but he produces no evidence in support of this assertion; nor in support of his assertion that the British manufacturers get their labor at about half the cost the American makers pay.

"The difference between British and American standard thickness, as shown on the table given in Mr.

Donald's article, is largely due to the difference in the screwing standards of the two countries. Up to 2 in. the difference is very slight and British gas tubes are, if anything, heavier than American standard tubes for gas, water and steam, while British steam tubes are very considerably heavier. For sizes above 2 in. American tubes are heavier than either British gas and steam tubes, but this is entirely due to the greater thickness of metal required to carry the coarser American thread.

"Mr. Donald asks why there should be different pipes for water, gas and steam? This question should be addressed rather to consumers of pipes than to manufacturers. British manufacturers are frequently blamed for their reluctance to comply with the requirements of their customers and for assuming an attitude of 'This is what we make—you can take it or leave it.' That is obviously the attitude of the American manufacturers with regard to standard pipes for gas, water, and steam. It would be a decided advantage to British manufacturers to supply only one quality of tube for different purposes, but there are other considerations than the convenience of manufacturers, and we are inclined to believe that if any change is made American manufacturers will follow British practice, rather than British manufacturers American practice, with regard to the different standards for gas, water and steam tubes.

FITTINGS AND COSTS

"Under this heading Mr. Donald makes the assertion that U. S. pipe is tested to a higher pressure than British steam pipe. This is not the case, and here Mr. Donald produces no evidence in support of his assertion.

"American manufacturers are praised for confining themselves to tubes and refusing to have anything to do with fittings, while British manufacturers are condemned for wasting time on fittings. Were the position reversed we should no doubt have found Mr. Donald reproving British manufacturers for their stupidity in allowing articles so essential to their industry as fittings to be manufactured in separate establishments.

"We have no means of checking the figures given by Mr. Donald. Comparisons based on war conditions are altogether valueless. During normal times British manufacturers have to meet the competition of German, Canadian and American manufacturers, and the fact that they have been able to do so and increase their foreign trade in the past seems to point to there being something in their manufacturing and selling methods which meets the requirements of their customers, and we have no doubt that after the war is over they will be able to regain whatever portion of their trade has been lost to America as a result of the disadvantages they at present labor under owing to the war."

British Standard Specifications in Foreign Tongues

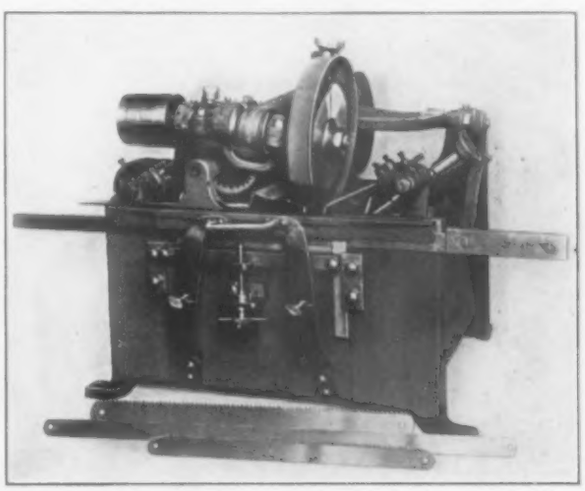
The British standard specifications have been translated into French, according to a paper presented by the secretary of the Engineering Standards Committee before the British Association, at Newcastle, Sept. 7, discussing the work of the committee. It is hoped to translate them also into Spanish and some consideration is being given to the possibility of putting them into Russian. As the author phrased it, every effort must be made to insure that the British standard specifications are readily available to foreign purchasers as well as those in the British Empire. Incidentally he mentioned, as an indication of what may be expected in commercial contests after the war, that the German League of Economic Associations has recently been formed out of the six great associations of German engineers, architects, furnacemen, chemists, electricians and marine engineers, numbering some 60,000 members.

Plans for the shipyard of the new Northern Shipbuilding Company, Tacoma, Wash., have been practically completed by John Martinolich, president of the company, and work will begin shortly. The company will construct wooden vessels, for which several orders have already been taken.

Grinding Machine for Hack-Saw Blades

The Wardwell Mfg. Company, Cleveland, Ohio, has brought out an automatic power hack-saw blade grinding machine which is said to be the first machine of the kind ever placed on the market. It has a one-piece frame, with all wearing parts of steel. A bronzed bushed grinding wheel head is suspended at the end of an arm hung from hardened steel pivots. In this way all slides are eliminated and freedom from all vibration of the grinding wheel head is obtained. The grinding wheel head has both radial and thrust adjustments.

A slotted eccentric provides a quick adjustment of the feed and a double pawl positive feed movement not only provides a continuous feed to the saw but also draws it in and discharges it from the machine, and so permits every tooth to be resharpened. Tension screws on a spring vise are relied upon to regulate the proper grip of the blade, while a screw raises or lowers the



In this Automatic Machine for Resharpening Power Hack Saw Blades a Double-Pawl Mechanism Is Provided to Control the Movement of the Grinding Wheel and the Blade Is Held in a Spring Vise

blade, should it be warped high or low in the middle. Four adjustments control all movements.

It is stated that these movements are so accurate and that the grinding wheel spindle is under such perfect control that as little as 0.0005 in. can be removed from the face or back of the saw blade tooth. The machine is extremely simple, it is said, so that a boy can operate it, and that a continuous stream of blades can be fed through it at the rate of 65 teeth per minute. This means that from 14 to 18 blades 18 in. in length can be resharpened in an hour.

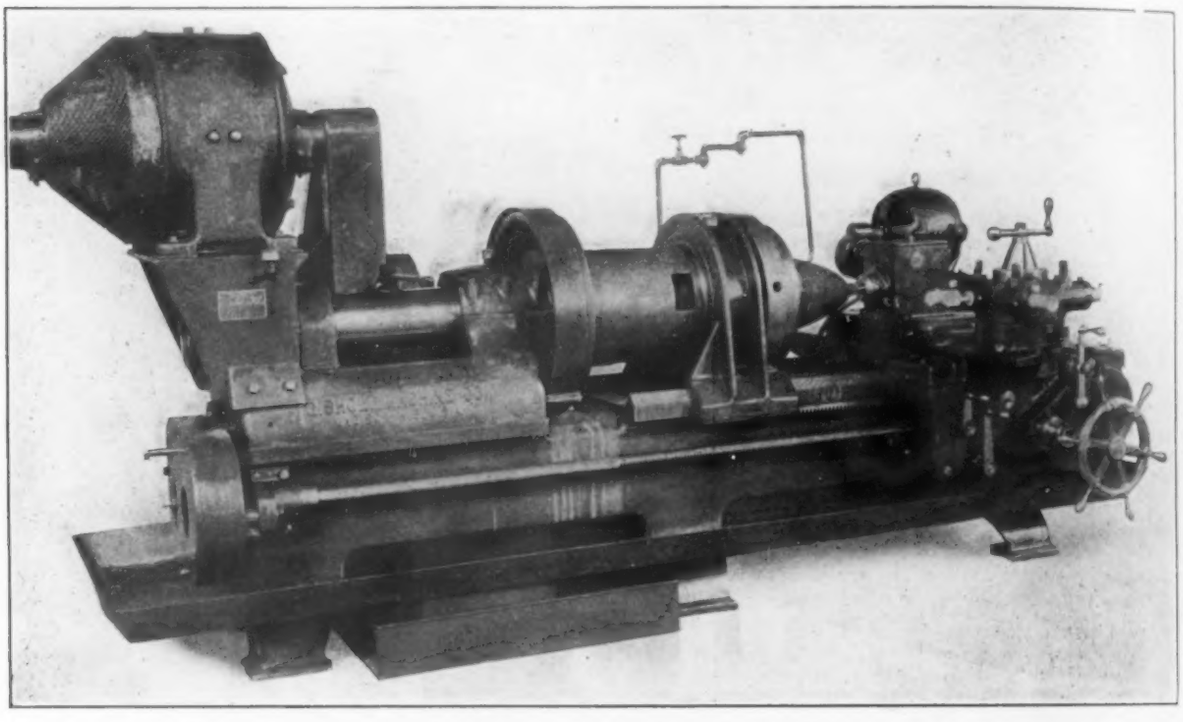
The blades are sorted by the operator, those of the same width and pitch being run through in groups so that it is not necessary to stop the machine. Any width or length of blade with teeth up to as fine as 33 per inch can be resharpened, and it is claimed that as the blades become dull they can be resharpened six or eight times or more, depending on the material being cut. It is stated that the actual cost of resharpening one blade does not exceed 2c., and that the use of a machine will result in a great saving to users of power hack-saw blades who now throw away those blades as soon as they become dull.

At the annual meeting of the Association of German Ironfounders, held recently, Herr Mettler of Berlin stated that under war conditions Germany had succeeded in dispensing with tungsten and in producing an iron which had more than twice the electrochemical properties of copper and that Germany's future lay in the electric furnace.

More natural gas was used in the United States in 1915 than in any other year, according to statistics completed under the supervision of J. D. Northrop of the U. S. Geological Survey. The quantity was 628,578,842,000 cu. ft., which exceeds by 6 per cent the record established in 1914.

A Special Lathe for Projectile Work

A special machine which makes it possible to take the finish boring and facing cuts and also mill threads in either the base or nose end of a shell has been developed by the Gisholt Machine Company, Madison, Wis. With this machine it is possible to perform the boring, facing and threading operations without transferring the shell from one machine to another, which, it is emphasized, eliminates the time required for rechucking and also secures a perfect thread. Two sizes of lathe are built, the one illustrated having a nominal swing of 25 in. with a 10-ft. bed, which enables shells up to 12 in. in diameter to be handled, while the other which will handle shells up to a maximum diameter of 16 in. has a swing of 29 in. and a bed 16 ft. long. The



This Special Projectile Lathe Was Developed to Enable the Finish Boring and Facing Cuts to be Taken in Shell Blanks and Threads to be Milled in the Nose End at One Setting

thread milling attachment can be adapted for cutting right or left hand threads, either internally or externally, of either the United States standard or metric pitches.

The collet chuck is supported at the outer end by a heavy steady rest and is driven directly from a spiral pinion on the backgear shaft that meshes with a spiral gear secured to the collet chuck flange which in turn is secured to the end of the spindle nose. The spindle has a bore of 6¼ in. and a ball bearing against the rear housing takes care of the end thrust. The other bearings are large and are provided with bronze bushings. A silent chain transmits the power from the driving motor to the backgear shaft. The tool post, which is a steel casting, is mounted on the front of the cross-slide. Four holes, 2¾ in. in diameter, are provided for mounting boring bars equipped with either single or double end cutters. An index pin on the cross-slide is relied upon to line up the tool post holes with the spindle when the latter type of cutter is used.

The thread milling attachment is mounted on the rear of the cross-slide and has a radial adjustment for aligning its spindle with that of the lathe. The spindle of the attachment is mounted in adjustable bronze taper bearings and has thrust washers and an adjustable collar to prevent backlash of the spindle. The spindle is driven by a worm and worm-wheel and spiral gears from the small motor mounted directly on the cross-slide. Special back gearing is provided for reducing the speed of the lathe spindle to the proper one for milling the thread at one revolution. An arbor for a hob is provided on the spindle and an adjustable cam at the front end of the cross feed screw is furnished to feed the hob in to the correct depth of thread before the main spindle starts to revolve.

A lever on the headstock enables either the slow speed for thread milling or the regular rate for boring and turning to be secured, while change gears are provided to vary the relation between the boring and milling speeds to suit conditions. The customary change gears for obtaining the various feeds and threads required for the screw cutting operation are provided and three rates of quick change feed are available at the headstock end. The power feed for boring operates through a rack and pinion and an interlocking mechanism is provided to prevent the engagement of conflicting feeds.

The Excelsior Pulley Company, Cuba, N. Y., has been completely reorganized and is vigorously reaching out for a larger share of the trade in wood-split pulleys. In March of this year M. A. Howell purchased a controlling interest in the company and assumed active management of it. None of the previous officers is now connected with the company. The new owners have installed new power and added new machinery. Among the additions to the equipment are a new two-cylinder 150-hp. gas engine, a planer, a jointer, a cut-off saw, lathes, etc., which will more than double the former capacity of the factory. The new officers are as follows: M. A. Howell, president and general manager; E. Z. Howell, vice-president and treasurer; C. F. Zietlow, secretary.

The Vulcan Fuel Economy Company, maker of the Vulcan soot cleaner for water-tube and tubular boilers, 230 South La Salle Street, Chicago, is now the name of G. L. Simonds & Co. The personnel of the organization remains the same. The only change, in addition to that of the name, is an increase in capital, the better to handle the company's business.

Ferromanganese Alloys by Electricity

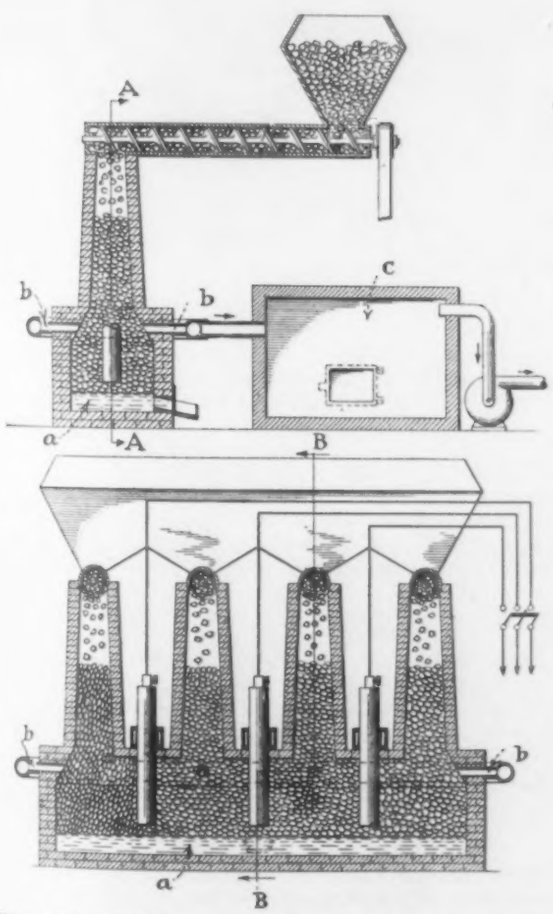
The production of ferromanganese alloys from the waste clinker or cinder from zinc furnaces in an electric furnace, at the same time recovering the zinc, is a recent new process. It has been invented by Harry Schragin, South Bethlehem, Pa., and is covered by U. S. patent 1,190,679—July 11, 1916.

The waste clinker or cinder from zinc smelters, using franklinite or willemite zinc ores, such as the New Jersey Zinc Company smelts in making spiegeleisen, is crushed to a suitable size, mixed with 25 per cent by weight of waste coal dust and a quantity of limestone flux. The cinders referred to contain approximately 15 to 22 per cent MnO. They also mixed with about 28 to 56 per cent FeO, 20 to 30 per cent SiO_2, 8 per cent carbon, 6 per cent Al_2O_3, 10 per cent CaO, about 4 to 5 per cent ZnO, and about 2 per cent MnO.

The charge is placed in a hopper, shown in the illustration of the furnace, and is fed by the screw conveyor to the furnace stack. The current is turned on when a sufficient amount of the charge has accumulated around the electrodes. The temperature is then brought up to 1500 deg. C., the process of charging continuing in the meantime. The charge melts collecting as a pool *a* where the molten iron and manganese settle, the slag rising to the top. An alternating current is preferred rendering the control of the temperature easier.

The zinc is volatilized and drawn off by suction through the openings *b* to the chamber *c*, where it settles. Any zinc passing up beyond the pipes is condensed by the down-coming cool charge and returned to the fusion zone. The atmosphere is reducing and the temperature is not allowed to exceed 1500 deg. C to any extent.

Silicospiegel is claimed as a possible product by using a modification of this process and is covered by a patent, U. S. 1,190,678—July 11, 1916, granted to

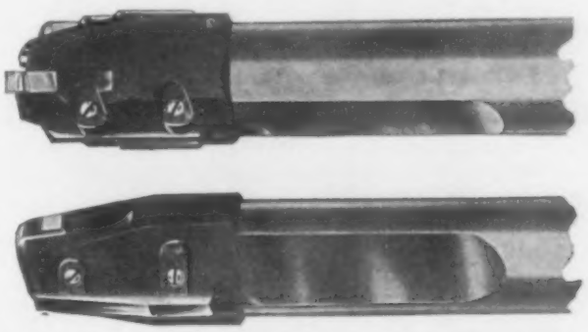


Two Sectional Views of Electric Furnace for Producing Alloys of Iron and Manganese

the same person. The charge is substantially the same but the temperature is raised to 1800 to 2000 deg. C. The volatilized zinc is collected as before, but the silicon is reduced along with the iron and manganese, producing an alloy containing from 10 to 15 per cent silicon, 10 to 30 per cent manganese, 15 per cent aluminum and 60 to 70 per cent iron.

Three-Cutter Boring Head for Shells

An inserted-blade type of boring head for shell work has been placed on the market by the Black & Decker Mfg. Company, Baltimore, Md. Two heads comprise a set, one being used for roughing the side walls and the bottom of the shell, while the other finishes the same



A Boring Head for Machining the Side Walls and Bottom of a Shell Interior Which Has Two Side Wall Cutters Set at an Angle of 180 Deg. and an Overlapping Bottoming or Nosing Cutter Located Midway Between Them at a Right Angle

surfaces. The advantages claimed for the use of this head are an economical use of high-speed steel as the blades are of small cross-section and can be removed and reground a number of times, a system of support for the blades which is relied upon to eliminate chatter and special arrangements for clearing the blade of chips and supplying lubricant to the point at which the cutting is being done.

Each head contains three blades, two side wall cutters at diametrically opposite points on the periphery of the head and a nosing or bottoming cutter which is set in the end of the head midway between the other cutters or at right angles to them. The rear of the latter cutter overlaps the side ones, and in the case of the finishing head all are ground to give the proper contour which, it is explained, eliminates the possibility of a shoulder being left in the shell at the junction of the bottom and side walls. The blades are backed up and supported by the metal of the head and a wedge and a screw system of clamping is employed which, it is pointed out, renders the possibility of a blade becoming loose and chattering when in service rather remote.

The cross-section of the blade is small and it is possible to remove the blades and regrind them several times before they have to be discarded. In this way, it is emphasized, a large source of waste, inherent to the solid blade boring head when working to the close tolerances common in munition work, is done away with and economies are thus effected in the use of high-speed steel. Arrangements have been made to provide an unobstructed path for the chips produced to flow back from the blades. When cutting is being done the blades are flooded with lubricant under pressure through a central lead with an inlet at the turret end of the head. The heads, clamps and screws are case hardened and the shanks are ground to fit the turret with keyways and flats to suit the opening in the turret.

T. A. Willson & Co., Inc., Reading, Pa., manufacturer of eye protectors, has been awarded a large Government contract of an unusual character. It is stated to be the first official order ever issued for eye protection equipment for the exclusive use of the country's armed forces. The company's Albex eye protector has been adopted and standardized by the War Department and will soon be a part of the regular equipment of 50,000 troops. The company had previously received an order for about 25,000 goggles for shipment to El Paso and other Southern points. Within a few months about 75,000 enlisted men will be equipped with Willson eye protectors.

PRODUCER GAS FOR BOILERS

By-Product Producers Held to Effect Large Savings in Steam Plant

Exceptional economic possibilities are offered in the firing of steam boilers in large steam plants by recovery-producer gas, recovering ammonium sulphate a by-product, according to an article by T. Roland Wollaston in the *Engineer*, of London, Aug. 25, 1916. Basing his figures on English practice, the author states that with coal of good producer quality delivered for 6s. per ton, there is obtainable from each ton 90 lb. of ammonium sulphate, valued at 9s. 6d. The difference, 3s. 6d. covers running and capital charges, power thus being obtained at no cost. The demand for ammonium sulphate, he says, is constantly increasing and its price in the past has fallen and risen with that of coal. There is no probability, he holds, that the commercial possibilities of the scheme suggested will ever be less than they are at present.

The operation of a 15,000-kw. (20,000-hp.) central station with a load factor of 25 per cent, is analyzed with reference to the cost with ordinary coal-fired boilers and with recovery-producer gas firing. It is assumed that the coal-fired boilers will operate at 70 per cent efficiency and the gas-fired boilers at 83 per cent. The coal-fired boilers will use 2 lb. of coal per horsepower-hour, including banking and standby. Recovery gas producers will, on common slack, work at 68 per cent cold gas efficiency, and yield sulphate of ammonia equal to 4 per cent of the coal gasified. They will also generate their own blast steam. To secure the above efficiency, the gas plant should be worked at full load, from which it follows that gas firing should be adopted only for the average load factor, 5000 hp., the peaks being carried by the coal-fired boilers.

The additional capital outlay and operative changes required for the gas-fired plant may be taken as follows:

Extra capital outlay	£22,500	($109,125)
Extra labor on plant (per annum)	2,100	(10,185)
Extra stores (per annum)	700	(3,395)

If 5000 hp. be considered as the dead steady load throughout the year the normal annual coal consumption would be 39,107 gross tons. The combined efficiency of the gas plant and gas-fired boilers would be 56.44 per cent, compared with 70 per cent for coal-fired boilers, and the coal consumption would approximate 48,500 tons annually.

Basing the cost of acid for fixing the ammonium sulphate at £2 per ton, and coal at 15s. per ton, with an assumed value of the ammonium sulphate at the works of £15 per ton, the following balance sheet may be made up:

NORMAL PRACTICE

Dr.		
To 39,107 tons coal	£29,330	($142,250)

PROPOSED PRACTICE

Dr.		
To 48,500 tons coal	£36,375	($176,500)
To 1,940 tons acid	3,880	(18,800)
To extra labor at gas plant	2,100	(10,200)
To extra stores at gas plant	700	(3,400)
To handling and bagging sulphate	646	(3,150)
To 14 per cent interest, depreciation and maintenance on £22,500	3,150	(15,300)
Gross operating cost	£46,851	($227,350)
Cr		
By 1940 tons of sulphate at £15	$141,135	
By 1940 tons of tar at £1	9.400	
		$150,535
Net operating cost		$76,815

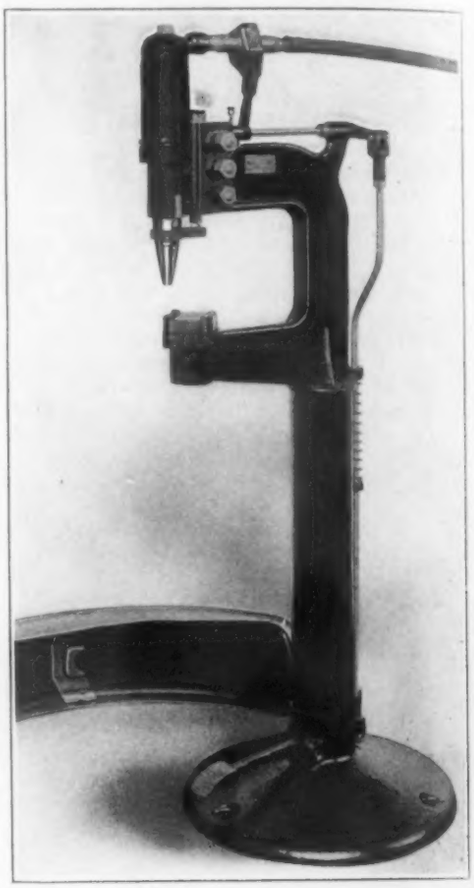
The net saving per annum is thus: $142,250 — $76,815 = $65,435.

Other minor debits and credits which will occur, such as an annual charge on extra land required, will probably balance, leaving a net saving according to the proposed system, based on the charges given above of about £13,000, or a return of 50 per cent on the investment.

A Pneumatic Pedestal Riveting Machine

For riveting small light parts that can be handled to better advantage in a stationary machine, the Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill., has designed a pneumatic pedestal riveting machine. It is operated by a foot lever which leaves the operator's hands free to handle the work. Although only one size of rivets is handled by the ordinary machine, a special arrangement can be supplied for handling four different sizes.

The machine consists of a pipe column supported on a cast-iron base which is bolted to the floor. At the opposite end of the column the yoke, which consists of a crucible steel frame, is fastened. The standard yoke has a gap of 8 in. and a reach of 11 in., but yokes of any desired dimensions to accommodate larger work can be furnished at a slight additional cost. The riveting head is of the builder's standard Boyer type and is furnished in three sizes for 1 1/16-in. rivets from 3 to 5 in. long. It is held in a clamp that can be adjusted to take care of the wear on the dies or any variation in the length of the rivets used. A special dolly may be supplied where it is desired to handle more than one size of rivet. The use of this fixture, it is pointed out, enables four different sizes of rivets to be used. Other advantages claimed for this arrangement are the ability to rivet in close corners and a low cost of replacement when the dolly becomes worn out.



A Pedestal Type of Pneumatic Riveting Machine Designed for Small Light Parts

The net weight of the machine when equipped with a head for handling the smallest size of rivets is approximately 173 lb.

Raw gasoline extracted from natural gas and sold in 1915 amounted to 65,364,665 gal., a gain of 53 per cent over the quantity marketed in 1914. The number of plants for manufacturing gasoline from natural gas increased from 386 at the begining of 1915 to 414 at the end of the year. The greater ratio of output increase is partly so because some of them operated only a part in 1914.

FOUNDRY BY-PRODUCT COKE*

Requisite Qualities—Amount of Air to Use—Manganese and Sulphur

BY GEORGE A. T. LONG

The requisites of a good by-product foundry coke are first, high carbon; second, low sulphur; third, good cellular structure, and fourth, that the product shall be uniform. The carbon and sulphur are primarily the result of the quality of coal which is used in the ovens for coking purposes. The structure, however, depends on proper preparation of the coal before coking, as well as upon the arrangement of the ovens in which the coal is coked and upon the temperature of the coking chamber. It, therefore, does not follow that all by-product cokes are suitable for foundry use.

In using coke in the cupola, as little wood as possible should be used, only sufficient to ignite the coke. The height of the bed above the tuyere depends on the metal being melted. For ordinary soft gray iron castings the bed should be brought up to 24 in. above tuyeres, settled and thoroughly burned through before charging any iron. With low carbon iron such as steel mixtures, a higher bed is required, no less than 30 inches above the tuyeres after settling, as low carbon may require more fuel.

How much iron shall we use to a charge? I contend the charge that is put on the bed should be used all through the heat, whether the heat be five charges or 50, as the closer we can work to the melting zone the better will be the results obtained. I also believe in making small charges, as this practice gives a more uniform mixture, keeps the iron hotter and saves fuel. In the ordinary cupola 24 to 36 in. inside, I use 1000-lb. charges; in cupolas from 36 to 54 in. I prefer 2000 lb. In cupolas larger than this, 3000-lb. charges would be the limit I would carry, using 1 lb. of fuel to 10 lb. of iron between charges, unless using steel mixtures. The larger the percentage of steel, the more fuel is necessary. For instance, with a 25 per cent steel mixture I would use 150 lb. of coke to 1000 lb. of metal, for the secret of all steel mixtures is in bringing the carbons up in order to get fluid metal.

HOW MUCH AIR SHOULD BE USED?

Nothing varies so much in foundry practice as the air going into the cupola. You will seldom find two foundrymen of the same opinion, or using the same air pressure. The pressure will range all the way from 6 to 30 oz. The lower pressure that you melt metal with, the better results you obtain; the oxidation is less, the sulphur is lower, and the metal is softer and truer to mixture. High blast pressure tends to combine the carbon and reduces silicon and manganese, causing hard iron. If the coke does not have a good structure it will not stand up and much the same trouble will result. A number of troubles attributed to coke, such as slag, hard iron, shrinkage, etc., can be all put down to high pressure.

FERROMANGANESE AND SULPHUR

As to sulphur, in one case the sulphur jumped up 0.15 or 0.20 per cent in the castings, and immediately the coke was assumed to be the cause, for it was said no change had occurred in the irons used. This was true, but upon looking into the matter I found they had discontinued the use of ferromanganese, owing to its high price, and this reduced their manganese as charged, about 0.40 per cent.

As to slag, when it starts right at the beginning of the heat it usually comes from too low a bed, which allows the air to reach the iron. With this condition slag will show at once. Very often the daubing used to line the cupola reduces the slag before the blast is put on; this is due to the nature of the clay used.

Some foundrymen think it is necessary to select large coke for the bed. This is a mistake, for all large size coke permits the passage of air too freely. The best results are obtained by straight forking with no attempt to select large pieces for the bed. Large coke leaves too much air space, while a mixture of sizes packs enough to confine the air and keeps the blast from too direct contact with the iron. Trouble with cold iron at the start of a heat is often due to a bed of large size coke, for with such a bed two or three charges must be melted before the coke settles properly.

A great many foundries over the country are using extra coke every few charges. This is an entirely wrong practice. They do this to renew a bed which has been lowered by melting too large charges of iron. As an example, a foundry I visited a short time ago has a cupola 42 in. inside measurement, with 13 in. from the sand bottom to the tuyeres. They were using 4000 lb. of iron to each charge with 450 lb. of coke between charges. Every seventh charge they used 200 lb. of extra coke. Still their iron was not right and they were troubled with slag. The cause of their trouble was too large a charge of iron and too much coke in a body. The charge of 450 lb. of coke would fill up the cupola considerably above the melting zone, and would have to be burned down to the zone before it would do any work. The large charge of iron would then force the melting zone so low that the air would reach the metal. In charging this cupola, I simply cut out the extra coke and charged 2000 lb. of iron to 200 lb. of coke, reduced the air from 16 oz. to 10 oz. and they have had no further trouble since this change was made.

CONTINUOUS MELTING AND THE LINING

In continuous melting where a cupola is run from 10 to 18 hr. a day, the charging is practically the same. It is not a question of how long you can run a cupola; it is a matter of how long the lining will last. The greatest trouble with continuous melting arises from the slag-notch closing up. I have not found anything equal to limestone for fluxing. The trouble with many cupolas built for continuous melting is that the slag-notch is too close to the tuyere. The slag-notch should be at least 10 in. below the bottom of the tuyeres; a slag-notch so placed practically will take care of itself and will not require continual poking.

In using by-product coke manufactured by people who are making a specialty of foundry coke one is sure to get a uniform product both in fixed carbon and sulphur. A uniform fuel is the greatest asset a foundryman can have.

*From a paper presented at the American Foundrymen's Convention in Cleveland, Sept. 15, 1916. The author is with Pickands, Brown & Co., Chicago.

William E. Leary, Jr., who was formerly manager of the Empire Foundry Company, New Brunswick, N. J., has become proprietor of the Brunswick Foundry Company, with plant at New and Neilson streets, New Brunswick, and will manufacture high-grade gray-iron castings. The Empire Company has been absorbed by the Simplex Automobile Company and has discontinued outside work, which has given Mr. Leary the somewhat rare opportunity of taking care of old customers with the same organization.

Two Conventions of American Chemists

The Chemical and Electrochemical Societies Discuss Electric Steel, Made-in-America Products, Coppered Steel—The Exposition

IN connection with the Second Annual National Exposition of Chemical Industries of the United States in New York during the week of Sept. 25 to 30, 1916, two important technical societies held their regular conventions—the American Chemical Society and the American Electrochemical Society. Both were largely attended and unusually successful.

American Chemical Society

Every department of chemical technology and manufacture was represented, both at the exposition and at the American Chemical Society's technical sessions. Chemical industrial preparedness was emphasized especially at the opening sessions. Brig.-Gen. William Crozier, chief of the Bureau of Ordnance, U. S. Army, at one of the early sessions, speaking on "Chemistry and National Welfare," said that modern warfare has made it necessary to draft a country's national resources in chemical knowledge and that there could be no room for doubt regarding the value of the chemical engineer in war as it is conducted to-day. He urged co-operation between the private chemical industries and the Government in the form of intelligent preparation for sudden emergencies.

President Charles H. Herty of the American Chemical Society, in thanking General Crozier for his address, said:

> The chemists of this country are ready to respond to a call at any time, and in them you have a reserve corps that can be relied upon in time of need.

THE TOLUOL AND NITROGEN QUESTION

Dr. Herty, in his annual address, made this important specific recommendation:

> Provision should be made in the immediate future for the storage of large quantities of Government-owned toluol. With the cessation of the European war orders for explosives and with the rapid increase of by-product retort ovens for coke manufacture, we shall eventually have a large over-production of toluol with consequent lowering of price. The potential value of the hydrocarbon in munitions is too great to allow its sacrifice as a fuel or illuminant, and its storage involves not unusual difficulties. The moral effect alone of its known presence in our midst would in itself fully justify the investment as a preparedness measure.
>
> Another suggestion is this: Modern warfare is largely dependent upon the successful work of chemists, not alone in the direction of munitions but through research in husbanding the resources of the country and in increasing knowledge which in times of stress may be vital to the nation. The military authorities should formulate a definite policy in regard to the chemist whereby in times of war his services may best be applied to the advantage of his country.

Dr. Nicholas Murray Butler, president Columbia University, where many of the technical meetings were held, in an address of welcome, spoke of the chemists' gathering as the mobilization of a very large part of civilization's fighting army.

Horace K. Porter, H. Koppers Company, Pittsburgh, read a paper at one of the meetings on "Coal and Coke By-products as a Source of Fixed Nitrogen," and gave the assurance that this country would not be in danger of a nitrogen famine in case of war, such as Germany faced when she was cut off from outside sources. He said that the available supply of fixed nitrogen from the coal in this country is adequate to meet the nation's military needs in any reasonable contingency. A compilation made by him shows that up to September, 1916, there were in this country the following plants and by-products ovens in the United States:

	No. of Ovens	Annual Capacity in Net Tons — Coal	Coke	Ammonia NH_3
Plants building	2,236	13,867,000	10,126,600	37,810
Plants completed	6,756	29,827,000	22,479,400	75,950
Total	8,992	43,694,000	32,606,000	113,760

	Net Tons
Annual capacity for ammonia at coke plants	113,760
Annual capacity for ammonia at gas works	12,500
Total annual capacity of coal carbonizing plants	126,260
Practical yield of 95 per cent nitric acid from this amount of ammonia (126,260 tons)	404,000
Total consumption of ammonia in United States in 1915	70,000
Ammonia capacity, at close of 1917, in excess of that necessary to make 180,000 tons of 95 per cent nitric acid	70,100

Industrial Conference on Electric Steels

As part of the extensive program of the convention of the American Chemical Society, an informal industrial symposium on "Alloy and Electric Furnace Steels" was scheduled for Wednesday afternoon at the Grand Central Palace. Dr. John A. Mathews, president Halcomb Steel Company, Syracuse, N. Y., presided. No formal papers were presented, but the successful and profitable discussion which resulted was introduced by the presentation on the screen of an interesting set of pictures by Dr. Mathews.

Starting with views reproduced from De La Piro's book on technology, printed in 1540, which discusses the earliest iron and other metallurgical processes, the chairman showed reproductions of the various types of modern electric furnaces, such as the Heroult, the Rennerfelt, the Snyder, the Grönwall-Dixon, the Roechling-Rodenhauser and the earlier types.

In addition, Dr. Mathews showed a view of the first Heroult furnace installed in the United States at his plant about 10 years ago and the furnace as it appears to-day, revealing some of the changes it has undergone. This, as well as the other furnaces at Syracuse, operates on hot metal from the open-hearth department adjacent to which it is located. The old furnace is single-phase and is the only single-phase Heroult furnace operating in this country. It and the others consume electric power from Niagara at a distance of 160 miles. Views of the Snyder and the new 6-ton Heroult furnace at this plant were shown.

ZIRCONIUM AS A REFRACTORY

Prof. Joseph W. Richards, Lehigh University, South Bethlehem, Pa., in introducing the discussion on electric steels deemed the subject an appropriate one before a convention of chemists. While the industry was in a transition stage, it had more than doubled itself in two years. At present the question of refractories was a vexing one because of the war, and he asked for testimony from the many prominent electric steel men present as to whether zirconium oxide was being used in any way, either as brick or as a substitute for magnesite.

The speaker called attention to the fact that one difficulty at present being experienced by electric steel makers was the pouring of the metal, it not being so successful from a large ladle as the more easily and carefully poured crucible steel, and hence not so freely separated from slag, etc. He felt that a solution for this was the use of an electrically heated ladle.

Professor Richards expressed the conviction that an important use for the electric furnace in the future would be as an adjunct to the Bessemer and open-hearth, and that much more would be heard of the tri-

plex process, for superior steel could thus be made at a minimum cost and better in quality than the open-hearth and at the same cost. He believed that the time was coming when all steel would be put through the electric furnace before incorporation in ingots.

TEMPERATURE OF ELECTRIC AND CRUCIBLE STEELS

Prof. Henry M. Howe, New York, called attention to the fact that crucible steel is never as highly heated as electric steel, and believed that the one might be better adapted to certain uses than the other. Dr. Mathews felt that from his experience the metal in the crucible was not materially different from that in the electric furnace, but the small ingot as poured from the crucible probably had its virtues. Dr. Mathews later stated that while the crucible was not adapted to making high-grade low-carbon steels, high-grade carbon and alloy steels could be produced cheaper in the electric furnace, and in response to a question he also said that all alloy steels that had been made in the crucible had also been made in the electric.

As to the relative merits of high-speed steel made in the crucible or in the electric furnace, Dr. Mathews informed the audience that probably 50 per cent of such steel now made in the United States is made in the electric furnace and that it would be impossible to pick one from the other. He felt, however, that the advantage of the electric furnace was not as great for high-speed as for alloy steels.

TRIPLEXING AND THE U. S. STEEL CORPORATION

It was developed during the discussion that the United States Steel Corporation is now using the triplex process at its plant at Joliet, Ill., where two 15-ton Heroult furnaces are operating. When open-hearth metal is available, metal from this is further refined in the electric furnace; but when only Bessemer can be obtained, the extra refining is completed in the electric furnace. It was also stated that chrome brick are being successfully used instead of magnesite.

The question as to the relative quality of electric steel made from cold or hot metal was brought up by Professor Tucker of Columbia University, and a reply by Ernest Humbert testified to the absence of any distinction, the deoxidation in each case being the same.

If there is really any superiority in electric steel over other steels in physical properties, it was asked whether there is any scientific reason for it. Professor Richards stated that the dead melt and the deoxidation obtainable were potent factors, and Dr. Mathews called attention to the striking quietness of electric steel when poured.

A CONSUMER'S TESTIMONY

Important written testimony from a large consumer of electric steel, K. W. Zimmerschied, metallurgist, General Motors Company, Detroit, Mich., was read by the chairman, in which the following striking points in favor of electric steel were emphasized:

1. It is freer from inclusions of any kind than any other steel.
2. It has a wider forging range in that it will stand a higher temperature than other steels.
3. It has a higher range for heating when worked, with less likelihood of the formation of coarse grains.

C. D. Young, engineer of tests, Pennsylvania Railroad, Altoona, Pa., made the statement that he had conducted a large number of static tests on electric steel castings of about 0.25 per cent carbon and had been unable to detect any superiority over good open-hearth steel castings.

Dr. G. B. Waterhouse, metallurgist, Lackawanna Steel Company, Buffalo, N. Y., called attention to the chance for the use of an electric furnace with an acid lining under present conditions if used in connection with the Bessemer and open-hearth, as in the triplex process, for sufficient refining is possible before the electric-furnace stage is reached.

Professor Richards recited the experience of a maker of saws using both the crucible and electric-furnace process. To distinguish the electric from the others in the finished saw, the steel was stamped with a double X. Some time later word came from the forests of the Far West that more saws with the distinguishing mark were wanted, for they seemed superior to any other saws. This point was taken up by Professor Howe, with the suggestion that the reason for this preference might have been psychological. Professor Richards expressed his faith in electric steel by the prediction that when as much experience has been had with electric steel as with crucible, no more crucible steel will be made.

URANIUM IN STEEL

The subject of uranium in steels was discussed by Dr. Charles M. Johnson, chief chemist, Park works, Crucible Steel Company of America, Pittsburgh, Pa. While 0.20 per cent of uranium is considered or claimed generally as conferring the same efficiency on tool steel as 12 per cent of tungsten, Dr. Johnson, in his examination and use of such steels, has not found the uranium steel as efficient. He has also discovered, in trying to produce uranium steel, great difficulty in getting uranium into the steel. It seems to possess a decided affinity for oxygen, so much so that he felt it might be regarded as having the strongest attraction for oxygen than any other element. Uranium steel that he had made, containing about 0.40 per cent carbon, 0.30 to 0.40 per cent manganese and about 0.30 per cent uranium, was very poor and exceedingly red short. While uranium now is about $7 per pound, tungsten has been higher; still he believes that a chromium-tungsten-vanadium steel is better and more efficient by 200 per cent.

The meeting was regarded as a complete success, and the attendance, which was large, included many metallurgists and steelmakers active in the electric steel and steel industry in general.

Professor Howe on Electric Steel

Since the above conference was held Prof. Henry M. Howe sent to THE IRON AGE the following communication on "Remediable or Irremediable Inferiority of Electric Steels," suggested by the foregoing conference, under the chairmanship of Dr. Mathews:

"The question whether the causes of the inferiority of electric steel are remediable or irremediable is evidently of far more than academic interest, for on its answer should depend, for instance, the course of the crucible steelmakers in repairing and extending their plants, to say nothing of the attitude of investors.

"It is natural and human that those directly interested in electric steel should bring themselves to believe that the causes are remediable and to explain the superiority of crucible steel by what may be called the accidental features of the present practice, such as the smaller units, the better conditions of pouring to which this small unit-size naturally leads, and the present greater skill of the crucible melters. But, granted the inferiority, the recognition of such causes as operative does not prove—it, indeed, hardly suggests—that the other and apparently irremediable causes are not operative also. The recognition of one kind of disadvantage of the electric process does not bear on the question whether other and suspected disadvantages are also operative.

THE QUESTION OF QUIETNESS

"For instance, one great cause of superiority of electric over open-hearth steel is held to be its greater quietness in the furnace, which leads to a more complete separation of the suspended matter, or 'sonims,' as Mr. Hibbard aptly calls them. Acid open-hearth steel in turn has a like advantage over basic. But, granted that electric steel has this advantage over open-hearth steel, we naturally ask whether it is not in this respect at a distinct disadvantage when compared with crucible steel. In the induction electric furnace rapid circulation is, I believe, unavoidable. In the arc furnace such circulation is to be suspected. First, those of us who are not electricians may reasonably suspect that the strong current of the arc itself, in the immediate neighborhood of the steel if not passing through it, will cause like circulation.

"Next, we naturally look for thermal convection cur-

rents of far greater activity than those in the crucible, in which the molten steel is heated by heat supplied to the outer walls of the crucible with a fair degree of uniformity. Moreover, this uniformity is increased by the interposition of the crucible walls between the steel and the heat. The electric induction furnace being so greatly at a disadvantage as regards quiet, we may here confine our attention to the arc furnace, in which the heat is supplied locally at an exalted temperature and diffused outwards through the walls of the furnace at a rate so rapid that a constant supply of heat through the arc is needed to make up for it. We naturally suspect that this extremely high local heating of the molten metal in the neighborhood of the arc should lead to thermal convection currents of far higher order of rapidity than those in the crucible.

"The reply that electric steel pours and lies quietly in the mold is beside the mark. If I stir water ever so rapidly in a pitcher and then pour it into a tumbler, it will lie practically as quietly there as if it had been quiet in the pitcher. This quiet in the ladle and molds shows only that the steel does not in itself contain sources of circulation and agitation, but it throws little light on the agitation which may be caused in the furnace by the induced electric currents and by the local heating from the arc.

INTENSE ELECTRIC HEATING

"Beyond this, this intense local heating in the arc furnace may well injure the quality of the steel. The very particles of molten steel through which the arc enters the bath should become very highly heated, and the rapid convection to which this local heating leads should expose a constant succession of fresh particles to this superheating, so that in time a very large fraction of the particles, if not all of them, may thus suffer. We do not know with certainty that this is harmful, but we may suspect it.

"A convincing answer to these important questions is hardly to be had from the mere general observations of even the most experienced and acute observers, but should, I believe, be based on direct experimental evidence."

The Electrochemical Society

The technical sessions of the American Electrochemical Society were held at the Hotel Astor. They occupied the greater part of Thursday and Friday, Sept. 28 and 29.

Symposium on "Made in America"

Only the unusual conditions brought about by the war made possible the success and importance of a symposium on "Made in America" which consumed the attention of the society's session on Thursday morning. With C. A. Lidbury, Oldbury Chemical Company, Niagara Falls, N. Y., in the chair, L. E. Saunders, Norton Company, Worcester, Mass., read a manuscript which was presented as the report of a committee which was responsible for the meeting. The object of the committee's work, the causes leading up to it and the results were in part as follows, as reported by Mr. Saunders:

"Several months ago a manufacturer of articles used in the electrochemical industry learned, by accident, that some of his products, which were being sold through dealers, were being put on the market as of European manufacture. A good deal of indignation was felt, and as a result all articles made by this company have since been marked with the maker's name and the fact that the articles are made in the United States. This incident was the occasion for starting the movement which has resulted in this session.

"The manner of going at the proposition has been to ask, first, the users of all sorts and kinds of articles to give their experience with those things made in the United States which have been purchased in whole or in part from abroad. Second, an endeavor has been made to get the manufacturer to defend himself against possible adverse criticism by furnishing data which he himself has collected, probably in all cases showing the superiority of the articles he manufactures.

"I shall endeavor in an unbiased manner to quote from the extensive correspondence, with the object of introducing personal discussion.

CARBON ELECTRODES

"A proper beginning for such a discussion in the electrochemical industry is the subject of carbon electrodes. Before the European war started, we cannot deny the fact that a large quantity was imported from various European countries. The replies to our inquiries from users have been extremely gratifying. Every user has stated that it is possible to secure, in this country, large electrodes of as good a quality as was purchased abroad two years ago.

"One user states that when the war started there were no carbons of large size to be compared with those of European manufacture. Another user states that some of our carbon manufacturers have been successful in improvement and others are not doing as well as they did when severe competition had to be met. Still another user says that they are unable to furnish any testimony in this respect, as they have used nothing but American-made electrodes.

"Some users have gone into detail in the matter of carbon electrodes, and have stated: First, that the perfection of manufacture is very high in our American-made carbons; second, that the resistivity is even less than the best of European carbons and that annealing has been so perfectly done that breakage almost never occurs. This user is, of course, an enthusiast, for those of us who use carbon electrodes realize the Utopian nature of the last statement.

"One of the complaints that has been made by a user is that the price of European electrodes delivered was about 40 per cent less than the cost of the best American electrodes during the past year, and that there is no such difference in quality as to warrant such a difference in price. It is, perhaps, needless to point out that we do not know what the cost of European electrodes might now be delivered in the United States, but it is safe to say that it would not be the cost at which they were sold two years ago, and there is at least a question whether such a difference in price will occur again when the manufacturers meet in competition. No manufacturer of carbon electrodes has sent us any testimony of his own.

ELECTROLYTIC ELECTRODES

"As to the use of electrodes in the electrolytic field there has been no adverse testimony regarding American made articles; in fact, they have so uniformly favored a single manufacturer that it becomes embarrassing to make any statement. All our other testimony on this subject states that graphite electrodes are used. I dare say the manufacturer has not considered it necessary to make any statement in reply.

AMERICAN PLATINUM

"One of our most prominent professors of electrochemistry has stated that no American-made platinum makes any pretense of being good. Other users state that platinum vessels have been supplied by American manufacturers containing so much iron and iridium that they cannot be used for accurate analytical work and are attacked when used on a large scale in other ways. This is a serious arraignment of American-made articles. We gave to the manufacturers every opportunity to meet objections of this character. We were unsuccessful. The calm and confident statement was made that competition of years had been successfully met by American-made articles.

PURE CHEMICALS

"On the situation with regard to fine chemicals, we have had no criticism in reply to our letters. In conversation, however, I have been told that it has been the experience of several users of potash salts of high purity that they cannot be obtained at the present time. A user has stated that this was so for a considerable period, but is being remedied. It is also stated that sodium salts, in many cases, are being substituted for potash salts formerly used in an analytical way.

FERROALLOYS AND ELECTRIC STEEL

"The quality of the ferroalloys made in this country has always been, almost from the time of the beginning

of the industry, of the highest character, unless we hear something to-day to the contrary from some one with experience.

"As to electric steel, the testimony has not been large, and it may be that something has been escaped in the investigation. I know that special steels have been made abroad which, during the early part of the shortage here, could not be duplicated. This, I believe, is rapidly being overcome and I feel safe in saying, subject to correction at this meeting, that electric steel, of all qualities, made in this country has never been excelled.

CHEMICAL GLASSWARE

"The matter on which we have received the greatest amount of testimony is the chemical glass industry. The users are, to a considerable extent, pessimistic. Quoting from a well-known college professor, the statement is made:

> American glassware is very much inferior in workmanship, in most cases in quality, besides costing anywhere from 2 to 5 times as much.

"Another large user states that we cannot make a suitable glass without potassium and the proper silicates, nor without the proper clay materials for the pots, and these are not obtainable in this country. The same user is extremely pessimistic about remedying this situation. He states that in many cases abroad it is a family affair, the making of fine glassware, and the son follows in the father's footsteps, these men not being willing to leave their country, and when they do, they can command better wages than the industry can afford to pay.

"Another user states that compared with Jena glass, certain American-made glasses are more resistant to the action of both acids and alkalis, especially the latter, for example: When boiled in 10 per cent sodium hydroxide solution, its loss in weight was less than 60 per cent of that sustained by Jena glass under the same conditions. Its resistance to shock and to sudden changes of temperature seems to be somewhat better than certain imported glassware. Another user states that resistance to sulphuric acid was higher in the case of American glass than of the best imported glass. On the other hand, one user states that he is unwilling to publish the data he has obtained on both glass and porcelain for patriotic reasons.

"All manufacturers are agreed that our greatest difficulties at present are with light blown glassware. This kind of ware can be produced in this country and it is simply a question of quantity rather than quality that is troubling the user. The manufacturers of glassware have stated, in one case, that the linear thermal expansion has been reduced in the glass of his manufacture to just about half that of the imported glassware. One manufacturer gives results of tests in regard to breakage on sudden cooling. The beakers are filled with paraffine, and heated to a desired point, then immersed in water at 15 deg. C. The temperature reached before fracture averages 253 deg. C. No data is given with reference to beakers of foreign manufacture. Tests were also conducted in the way of resistance to fracture by dropping. The beakers are dropped from varying heights on to a 2-in. pine plank. The average height which these beakers withstood was 30.7 in. A large number did not break at 36 in., and were not carried further. These are tests which apparently are used to give a favorable comparison of American glassware against that of German make.

"Testimony, both by the user and the manufacturer, seems to be overwhelmingly in favor of the conclusion that American-made glassware can be secured which excels in numerous properties that which has been imported from abroad.

CHEMICAL PORCELAIN

"A subject of great importance is that of chemical porcelain. Here we have again had much testimony, principally from the manufacturer. That there is a prejudice, however, may be seen in the statement of a prominent member of this society, as follows:

> I certainly was surprised at the cracking of a small porcelain crucible I was heating. I could not find the crossed swords on the bottom. It probably would have had "Made in America" on it if marked at all.

"By the testimony which follows, it would seem that even so high a recommendation as the crossed swords is not the *ne plus ultra* which this testifier would have us think. One man who states that he has used American-made porcelain in four weeks of summer school says that he has lost all idea of ever being able to secure good American poreclain. Turning from this pessimist for a moment, it is good to find such testimony as the following:

> Heating and cooling test, American made porcelain against Royal Berlin, number cracked or crazed: In the case of Royal Berlin one; American make none. The test consisted in heating the sample to 1700 deg. Fahr. and then removing with a pair of steel tongs and tossing upon a steel plate in a draft. Next test, solubility in 25 per cent sodium hydroxide, boiling for six hr.: American made porcelain, 1.15 per cent; Royal Berlin, 1.8 per cent.

"Another user has stated that his bills for both glassware and porcelain have been cut in two by the use of American-made ware as compared to that of foreign make.

"In the case of electrical instruments we believe that the situation has not changed since the war, as American-made instruments, by common consent, are the best in the world. Chemical balances are made with great success in this country; machinery used in the electrochemical industry has been nearly always secured here; microphotographic apparatus made here, it is stated, is far ahead of anything made in Europe. Articles like filter paper have been long made of high quality; microscopes of American manufacture cannot be excelled. Some other instruments which have been made abroad are being worked on now in this country

General Discussion

In the discussion which followed this report A. T. Hinckley, National Carbon Company, Cleveland, Ohio, called attention to the fact that while many large electric furnace electrodes were imported before the war, it was partly because the furnaces were of foreign make and needed foreign electrodes; American electrodes, however, are now superior. He claimed that American electrode makers' trade would expand and he regarded the growth of the industry as noteworthy.

John Wood Beckman, Great Western Power Company, San Francisco, Cal., reported that on the Pacific coast acceptable electrodes were being made from lampblack produced as a by-product in cracking oils.

Dr. Allerton S. Cushman, Washington, D. C., made an effective plea for a service test over a period of years as a measure of quality. He deplored the present tendency to accept at its face value superficial or what he regarded as unsatisfactory tests such as throwing heated porcelain on a steel plate in a draft to determine its quality. In his experience in using American porcelain Gooch crucibles, he had found them unable to withstand tests under a vacuum because the bottoms came out—something which never occurred with foreign wares.

Dr. W. H. Walker, Massachusetts Institute of Technology, Cambridge, Mass., testified that after using a large amount of American-made chemical porcelain and glassware, he understood that the material was promising, but that much tolerance was demanded. Dr. Dorsey A. Lyon's remarks were in favor of the porcelain and glassware, but to the effect that no satisfactory filter paper had been found.

Prof. Joseph W. Richards recited the experience of a large South American copper smelting company which had depended on German fused magnetite electrodes, 60,000 having been ordered and, nearly put out of business by the war, they had finally succeeded in making a better similar one than the one they had thought irreplaceable.

Copper Steel and Corrosion

The familiar question of the value of copper steel as a resistant to corrosion was an important feature of the meeting on Thursday afternoon and elicited a spirited discussion by two prominent advocates of both sides. The conclusions of the investigations of E. A. and L. T. Richardson in their paper on the subject are given in another part of this issue of THE IRON AGE.

The paper was presented only by title in the absence of the authors.

Dr. Allerton S. Cushman, Washington, D. C., was the first to discuss the paper and he characterized it as curiously placed on the program of an electrochemical society. It should rather be before a deliberation of prominent iron and steel metallurgists. He regarded the paper as "one more nail in the Hindenburg statue in favor of coppered steel." The fact that his extensive work on the subject was not referred to was a surprise to him. To be sure he had not lately presented numerical data because he did not want to go off half cocked. He was at present conducting extensive tests on over 1000 pieces of 26-gage material of all kinds, but he felt that a decidedly long stretch of time was necessary in arriving at conclusive or at least valuable data. Some of his specimens had already lasted 1400 days.

Dr. Cushman strongly expressed his feeling that the data that were here presented together with all previous similar information had created the impression that rolled sheet metal is worse than it really is, and he stated that this paper's conclusions were unjustified on any experimental data. They were new, to be sure, and important if true. That copper improves steel and not iron was based on results from small test pieces in semi-rural districts.

BRITISH CORROSION TESTS

The recent work of the Iron and Steel Institute (British) was mentioned by Dr. Cushman as coming from some of the most distinguished scientific men in the world. Doctors Hadfield and Friend had come to the conclusion from their tests that the presence of carbon and manganese were important; they did not mention copper. The speaker cited the ancient irons as wonderfully resistant to corrosion but free from copper. He was still unconvinced that copper was proved as the beneficent element, for he knew there were many factors entering into the problem.

In his tests Dr. Cushman said that Bessemer steels rusted faster than open-hearth as determined by 600 samples over a period of three years. What is the explanation? It is conceded that Bessemer contains more gas than open-hearth steel, but the question of gas content had not been exhaustively studied in its relation to corrosion. "I have," he stated, "a great deal of data containing new discoveries which will come out in the not distant future, whether I live or not. I claim that, based on any evidence compared with other evidence, the acceptance of the conclusions of this paper would be wrong."

D. M. Buck, metallurgist, American Sheet & Tin Plate Company, Pittsburgh, Pa., spoke of the very large number of full sized tests of different brands exposed to different conditions for 5 or 6 years and asserted that he had arrived at the definite conclusion that copper was a benefit, that it improved any good heat of steel, but not a rotten heat. Bessemer and some open-hearth sheets had failed in one year. Copper when added to pure iron he had found was a benefit.

AMERICAN SOCIETY FOR TESTING MATERIALS WORK

Dr. Cushman called attention to the extensive and important tests about to be inaugurated by the American Society for Testing Materials. He regarded it as a great undertaking, at great expense and labor, and believed its results would be far reaching. If they resulted contrary to his contentions he would find comfort in the fact that many others had erred. Mr. Buck expected definite results from this signal undertaking.

James Aupperle, metallurgist, American Rolling Mill Company, Middletown, Ohio, believed the authors drew conclusions from unwarranted data and did not know what kinds of steel they were using. I cannot tell the difference between an 0.03 per cent and 0.30 per cent copper steel in corrosion tests, he claimed, but have detected more gas in rusting material than in that that did not rust. Even high copper steel failed because of the presence of gases such as nitrogen and oxygen.

The fact that there is no standard test for corrosion was regarded as a matter of regret by both Doctor Cushman and Doctor Fink. The necessity in all cases that steel should be as good and pure as possible was contended by the former, who claimed that often this was not the case.

The Chemical Exposition

The Second National Exposition of Chemical Industries, occupying two floors at the Grand Central Palace, New York, was a gratifying success. The combined capital represented by the almost 190 exhibitors reached the stupendous total of $275,000,000,000. A feature was the fact that many of them were new companies or industries owing their existence and success to the war. Many steel, iron and by-product coke plants were represented. Among those exhibiting the following may be mentioned:

Abbe Engineering Company, New York City.
American Coal & By-Product Coke Company, Chicago.
American Transformer Company, Newark, N. J. (With Research Corporation.)
Baker & Adamson, New York City.
Baker, J. T., Chemical Company, Phillipsburg, N. J.
Barrett Company, The, New York City.
Bausch & Lomb Optical Company, New York City.
Benzol Products Company, New York City.
Bethlehem Foundry & Machine Company, South Bethlehem, Pa.
Bristol Company, The, Waterbury, Conn.
Brown Instrument Company, Philadelphia, Pa.
Buffalo Foundry & Machine Company, Buffalo, N. Y.
Carborundum Company, Niagara Falls, N. Y.
Central Foundry Company, The, New York City.
Coatesville Boiler Works, New York City.
Detroit Range Boiler Company, Detroit, Mich.
Driver-Harris Wire Company, Harrison, N. J.
Duriron Castings Company, New York City.
Edison, Thos. A., Orange, N. J.
Eimer & Amend, New York City.
Electrolytic Zinc Company, Inc., New York City.
Foote Mineral Company, Philadelphia, Pa.
General Chemical Company, New York City.
General Electric Company, Schenectady, N. Y.
Holz, Herman A., New York City.
Koppers Company, H., Pittsburgh, Pa.
Laboratory Supply Company, The, Columbus, Ohio.
Lead Lined Iron Pipe Company, Wakefield, Mass.
Leeds & Northrup Company, The, Philadelphia, Pa.
Lehigh Car, Wheel & Axle Works, New York City.
Lehigh Foundry Company, Fullerton, Pa.
Little, Arthur D., Inc., Boston, Mass.
Mott, J. L., Iron Works, New York City.
Norton Company, Worcester, Mass.
Precision Instrument Company, Detroit, Mich.
Pittsburgh Testing Laboratory, Pittsburgh, Pa.
Raritan Copper Works, Perth Amboy, N. J.
Research Corporation, New York City.
Roessler & Hasslacher Chem. Company, New York City.
Ruggles-Coles Engineering Company, New York City.
Taylor Instruments Companies, New York City.
Tennessee Coal, Iron & Railroad Company, Birmingham, Ala.
Thwing Instrument Company, Philadelphia, Pa.
Tolhurst Machine Works, Troy, N. Y.
United Lead Company, New York City.
United States Smelting Company, New York City.
United States Bureau of Mines, Washington, D. C.
United States Bureau of Standards, Washington, D. C.
United Cast Iron Pipe & Foundry Company, Burlington, N. J.
Valley Iron Works, Appleton, Wis.
Westinghouse Elec. & Mfg. Company, East Pittsburgh, Pa.

Besides the Benzol Products Company, Marcus Hook, Pa., and others exhibiting the many intricate products made from benzol, toluol, etc., the H. Koppers Company showed a model of a complete by-product coke oven as well as the products.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., among other products, displayed the Thury regulator for electric furnaces, which is so extensively used by electric steel furnaces in this country.

The many interesting by-products from the manufacture of copper and its compounds, including tellurium, selenium, electrolytic silver and the slime as made by the Raritan Copper Works, Perth Amboy, N. J., attracted attention. Here also was shown the electrolytic zinc of the Anaconda Copper Company, which will be producing 200 tons per day at its new plant at Great Falls, Mont., by Nov. 1, 1916.

Many samples of the iron-silicon alloys, Duriron and Tantiron, were displayed by the Duriron Castings

Company, 90 West Street, New York, and the Bethlehem Foundry & Machine Company, South Bethlehem, Pa., producers respectively of these two alloys.

Herman A. Holz, 30 Church Street, New York, showed interesting instruments and crucibles made from the new alloy rhotanium, which is claimed to be a satisfactory substitute for platinum. This company also exhibited the Brinell meter for testing the hardness of metals.

The Buffalo Foundry & Machine Company's exhibit occupied the entire side of one floor and was an imposing sight.

At the booth of the American Electrochemical Society the extent to which practically every part of an automobile chassis is dependent on some electrochemical industry was uniquely portrayed.

A very largely attended smoker in the ballroom of the Hotel Astor on Thursday evening and an excursion up the Hudson on Saturday were two important social features of the combined conventions.

Iron and Steel Institute's St. Louis Meeting

The following tentative list of papers and addresses for the eleventh general meeting of the American Iron and Steel Institute, to be held at the Planters' Hotel, St. Louis, Friday and Saturday, Oct. 27 and 28, is announced:

The president's address, by Elbert H. Gary.

"St. Louis and Its Industries," by Clarence H. Howard, president Business Men's League, St. Louis.

"The Duplex Process," by Dr. G. B. Waterhouse, metallographist, Lackawanna Steel Company, Buffalo.

"Pulverized Coal as a Fuel for Metallurgical Furnaces," by James W. Fuller, president Fuller Engineering Company, Allentown, Pa.

"The Iron Ores of the Adirondack Region," by Frank S. Witherbee, president Witherbee, Sherman & Co., New York.

"Progress in Hot Blast Stove Design," by Arthur J. Boynton, superintendent blast furnaces, National Tube Company, Lorain, Ohio.

Friday will be devoted, as usual, to the reading and discussion of papers. The banquet will be held on Friday evening at the club house of the Missouri Athletic Association. The local committee is preparing a program for "Seeing St. Louis" on Saturday.

The general committee on arrangements consists of James A. Farrell, president United States Steel Corporation, chairman; James A. Burden, president Burden Iron Company; E. A. S. Clarke, president Lackawanna Steel Company; John C. Maben, president Sloss-Sheffield Steel & Iron Company; Charles M. Schwab, chairman Bethlehem Steel Corporation; John A. Topping, chairman Republic Iron & Steel Company; Frank S. Witherbee, president Witherbee, Sherman & Co.

The local committee on arrangements consists of Clarence H. Howard, president Commonwealth Steel Company, chairman; Thomas R. Akin, president Laclede Steel Company; Aug. A. Busch, Busch-Diesel Engine Company; B. F. Bush, receiver Missouri Pacific-Iron Mountain railroad systems; George W. Niedringhaus, vice-president National Enameling & Stamping Company; A. L. Shapleigh, president Shapleigh Hardware Company; George W. Simmons, vice-president Simmons Hardware Company.

The Russian Steel Industry

Orders received by the Russian steel trust, or the Prodamet, for the first six months of 1914, 1915 and 1916 were as follows in net tons, according to the British commercial attaché at Petrograd:

Material	First Half, 1914	First Half, 1915	First Half, 1916
Sheet iron	183,169	149,846	115,919
Girders	158,130	106,034	11,529
Sleepers	36,198	33,543	21,759
Hoop iron	71,164	61,346	14,396
Angle, band and section iron	540,637	537,964	632,711
Rails, light	27,900	13,862	51,517
Rails, heavy	209,858	245,341	132,107
Total	1,227,056	1,147,936	979,938

The war periods of 1915 and 1916 are considerably below the figures for the normal period of 1914.

PLATE MILL FOR JAPAN

Youngstown Building Machinery for Kobe—To Roll Plates 168 In. Wide

The William Tod Company, Youngstown, Ohio, builder of rolling mills, engines and rolling mill and steel works equipment, is building for the Imperial Steel Works at Kobe, Japan, a large plate mill which will be used for rolling heavy plates of a thickness up to 2 in., and width of 14 ft. The maximum length to be rolled will be about 60 ft. The mill train will consist of two stands of two-high reversing mills and the pinion housing. The first stand will be used as a roughing mill for the smaller plates and as a roughing and finishing mill for the plates of maximum width and thickness. The main rolls will be 49 in. in diameter by 180 in. in length. The second stand is a smaller mill having rolls 44 in. in diameter and 145 in. in length.

Some idea of the size of the pinion housing may be had from the following: The maximum height of the housing assembled is 18 ft., 3 in., the width of the base is 16 ft. and the length over the ends of the pinions is 24 ft. 6 in. In addition to inclosing the main mill pinions, the pinion housing also contains a 2½ to 1 reduction gearing for increasing the power transmitted from the engine to the mill. The main mill pinions are 68-in. pitch diameter by 60-in. face, while the reduction gears, of which there are two sets in the housing, are 40 in. and 100 in. in pitch diameter and of 30-in. face. The teeth are double helical, planed on special gear-cutting machines. The mills and the pinion housing are placed in line, the second mill being driven through the rolls of the first mill. All the spindles for driving the mill are of the Tod "no backlash" type, with universal couplings.

Connecting to the 40-in. pinions of the reduction gears, and for driving the roll train, the company is furnishing a 44-in. and 76-in. x 60-in. twin tandem-compound reversing engine, similar in construction to the engine it installed some months ago at the plant of the Brier Hill Steel Company for driving its 40-in. blooming mill. The engine is one of the largest of this type installed at present in this country, and for driving these mills is geared down so that the mill rolls make 1 revolution to 2½ revolutions of the engine shaft to produce the rolling torque required for breaking down the ingots, which will weigh about 30,000 lb. The dimension from center to center of the two mill stands is 41 ft. and from the center of the first, or larger mill stand, to the pinion housing, is 40 ft. The distance from center line of the pinion housing to the center line of the engine is 26 ft.

The William Tod Company is furnishing the tables and transfers back of the mill stands which convey the plates and slabs from the first mill to the second mill, and also a large straightening machine to level the plates of maximum width and thickness, the run-out tables, cooling bed and cooling bed transfer, and the delivery tables leading to the shears, and also a device for weighing the thick plates.

Large Sheet Mill for Japan

The William Tod Company has recently received an order to build for the Ayen-Mekki Kabushiki Kaisha Company, of Japan, the first sheet mill, it is believed, to be installed in that country. It will comprise four 28 x 44-in. finishing mills, two 28 x 42-in. roughing mills, and two 26 x 44-in. cold mills, together with a 1000-hp. 8 to 1 reduction gear drive. The gear and pinion are inclosed and are provided with double helical planed teeth. This drive, when completed, will embody several new features not heretofore used in construction of drives of this character.

Koppers Coke Ovens at Steelton

The Bethlehem Steel Company has awarded to the H. Koppers Company a contract for a battery of 60 coke ovens, with by-product plant, for the Steelton, Pa., works. This will provide for 7700 gross tons of additional coke daily. Work starts at once on the contract and will be completed in about a year.

CORROSION OF STEEL SHEETS

Influence of Copper and Manganese—Presence of Copper Beneficial

The corrosion of iron and steel, with the relation of copper thereto, was discussed by E. A. Richardson, Warren, Ohio, and L. T. Richardson, Madison, Wis., in a paper, entitled "Observations Upon the Atmospheric Corrosion of Commercial Sheet Iron," before the regular fall meeting in New York City last week of the American Electrochemical Society. The conclusions resulting from their investigations are as follows:

Taken as a whole, the results indicate that copper-bearing steels are, without doubt, decidedly superior to any of the other materials tested. The remaining materials may be divided roughly into two classes, one class including the ordinary steels (Bessemer and open-hearth) and the other class the commercially pure irons and the copper-bearing irons. Charcoal iron is classed with the pure irons. We have obtained results in another test which would indicate that the resistance of wrought iron to corrosion is due to the purity of its iron and not to slag inclusions. In addition, it was noted during the present test that charcoal iron appeared to corrode in very much the same way as pure iron.

In regard to the steel-iron question, it is noted that the pure irons (including charcoal iron) are superior to steel. It is believed that this superiority is due to the purity of the iron, or to some combined effect of manganese and copper.

The results obtained in regard to the effects of mill scale do not agree with the results obtained by others. They indicate that with steels which rust rapidly mill scale is a stimulator of corrosion. On the other materials tested the mill scale has exerted a protective action. We have no explanation for this.

The important feature of the results, however, is that it substantiates the claim made in several other publications that the addition of copper to steel in amounts of about 0.25 per cent causes a remarkable increase in its ability to resist atmospheric corrosion. In the present test the addition of about 0.25 per cent copper to Bessemer or open-hearth steel has resulted in an increased resistance of 300 or 400 per cent.

The addition of copper to pure iron also results in an increased resistance to corrosion, but to no such an extent as the addition of a similar amount to steel. The addition of about 0.25 per cent copper to a commercially pure iron results in the useful life being increased by about 20 per cent.

INFLUENCE OF COPPER AND MANGANESE

We have been unable to determine the reason for this effect of copper in reducing corrosion. It is believed, in view of the fact that the copper exerts a greater influence in steel than in iron, that it must be due to the combined presence of copper and manganese, since the chief difference in the iron and steels under consideration is in the manganese content. It may be that the copper eliminates a harmful effect of manganese, or it may be that it is some combined effect of these two elements that acts as a protection to iron. The writers are inclined to believe that it is the latter cause.

Tests made by D. M. Buck indicate that copper even up to 0.10 per cent added to low manganese materials increases their resistance to corrosion but little. Ordinary steels containing about 0.40 per cent manganese, but no copper, are very poor as regards resistance to corrosion, but additions of copper to such steels result in a greatly increased resistance. A maximum resistance is reached with about 0.25 per cent copper. These results were also confirmed upon full-sized sheets of the same materials.

The writers believe, in view of these results, that the resistance of pure iron to corrosion could be increased by the addition of both manganese and copper and that additions of manganese to pure iron or steel, even up to 3 or 4 per cent, or more, with a corresponding increase in copper to produce a maximum effect, should give a material more resistant to atmospheric corrosion than the copper steel now on the market.

Also, some interesting results might be obtained by substituting for manganese in copper-bearing steels or irons, chromium, vanadium, tungsten or molybdenum.

SUMMARY

Copper-bearing steels are decidedly superior to pure iron, steel or charcoal iron.

The addition of copper to pure iron increases its resistance to corrosion, but to no such an extent as similar additions to steel.

Charcoal iron and pure iron are superior to steel as regards resistance to atmospheric corrosion.

Charcoal iron is very similar to pure iron in its resistance to corrosion.

Copper is believed to decrease corrosion due to some mutual influence of manganese and copper.

The additions of larger amounts of manganese and copper to pure iron or steel are suggested as well as additions of copper-chromium, copper-vanadium, copper-tungsten or copper-molybdenum.

Mill scale stimulates corrosion in rapidly rusting materials and retards it in slowly rusting materials.

Rhotanium, a Substitute for Platinum

An interesting and important alloy has been produced which is claimed to be an entirely satisfactory substitute for platinum, either as crucibles or as ignition tubes, thermo couples, etc. The new material is called rhotanium. Its composition is not revealed but it is announced to be an alloy of metals of the platinum group. Platinum has increased in value since the war started until its present price is about $96 per oz., or $3.85 per gram. The price of the new alloy is the same, but its actual cost about 50 per cent less since its specific gravity is about half that of platinum.

Some unusual claims are made as to the qualities of the new substitute. Besides its relative lightness, it is perfectly satisfactory for all work where platinum has had to be used, as for crucibles, dishes, boats, cones, tubes, wire, foil, gauze, etc. It is insoluble in hot, concentrated or diluted hydrochloric, nitric or sulphuric acids, and is not affected by alkalis or sulphide solutions. It will not oxidize at any temperature and is practically unaffected by fusion with alkali carbonates and similar fusion salts.

That a reducing flame does not produce the crystalline effect so common to platinum is another important claim. Rhotanium is very malleable and ductile, can be hammered, drawn or spun and its color is indistinguishable from platinum. Its tensile strength is about 20 per cent in excess of that of platinum and its hardness nearly twice.

A thermo-couple of this new allow is reported to develop an electro motive force nearly six times as high as that given by the platinum, platinum-rhodium couple and higher than that of most base metal couples at the same temperature.

The new alloy was discovered by Frank A. Fahrenwald of Cleveland, Ohio, and is being manufactured by the Industrial Research Corporation of the same city. The Eastern agent is Herman A. Holz, 50 Church Street, New York.

An Electric Steel Induction Furnace at Cleveland

The Cleveland City Forge Company, Cleveland, Ohio, W. N. Crafts, president, has bought the 21-ton Roechling-Rodenhauser electric induction furnace which the Eastern Metals Corporation of Bayonne, N. J., installed about 2 years ago but never operated extensively. The installation in Cleveland will soon be producing high-grade carbon and alloy steel ingots.

The project for the construction of a by-product coke-oven plant for the Hamilton By-Products Coke Ovens, Ltd., Sun Life Building, Hamilton, Canada, has been deferred until next year.

Pittsburgh Steel Company's Year

The annual report of the Pittsburgh Steel Company, Frick Building, Pittsburgh, has been issued for the fiscal year ended June 30, 1916. The gross sales were $21,848,035.67, against $11,649,863.97 for the previous year, showing an increase of $10,198,171.70. The net profits, after setting aside $500,000 for depreciation, were $4,564,067.18, against $858,160.02 for the previous year, being an increase of $3,705,907.16.

Shipments of the various products of the company during the year, compared with the preceding fiscal year, were as follows:

	1915-16		1914-15	
	Tons	Amounts	Tons	Amounts
Pig iron, billets and bars	244,118	$5,364,608	62,383	$1,482,439
Hoops, bands and cotton ties	40,530	1,260,842	36,468	1,045,573
Wire rods, plain wire, nails, fencing, etc.	334,113	14,506,902	234,921	8,829,394
	618,761	$21,132,352	333,772	$11,357,406
Miscellaneous products		715,683		292,457
Totals	618,761	$21,848,035	333,772	$11,649,863

The consolidated balance sheet as of June 30, 1916, is as follows:

Assets	
Real estate and plant	$19,353,634.70
Cash	1,003,596.94
Accounts receivable	2,363,640.97
Bills receivable	34,871.12
Inventories	3,830,735.65
Investments in companies at cost	42,004.76
Special deposits for redemption of notes, etc.	1,019,378.32
Royalties and other payments in advance	259,089.00
Deferred charges	34,356.52
Reacquired securities	10,100.00
Total	$27,951,407.98
Liabilities	
Preferred stock	$10,500,000.00
Common stock	7,000,000.00
Coupon gold notes	2,384,000.00
Accounts payable	1,865,372.08
Reserve for depreciation	500,000.00
Reserve for repairs and renewals	321,562.85
Surplus	5,380,473.05
Total	$27,951,407.98

In his accompanying remarks to the stockholders Wallace H. Rowe, president, said: "During the period under review appropriations were made for the construction of 4 additional open-hearth furnaces for the purpose of completing the steel-making unit of 12 open-hearth furnaces and to give the company an increase of 50 per cent in its steel-ingot production. Two of the furnaces were built by contract and were finished and put into operation on Aug. 10, 1916. The other two are in course of construction by the company's own forces and are soon to be completed; they are expected to be put into operation Oct. 1. Of the $5,000,000 notes outstanding June 30, 1915, there have been redeemed during the fiscal year $3,000,000, and of the remaining notes $1,000,000 were called for redemption and paid on July 1, 1916, and the remaining $1,000,000 have been called for redemption Oct. 1, 1916."

Grainger & Co., Inc., Louisville, Ky., has formally extended its charter so as to authorize 50 years' continuance of the company. This is one of the oldest going concerns in the Ohio Valley, conducting a structural iron works, a foundry and machine shops. It was established in 1833, near the present location, 119 to 135 North Tenth Street, by W. H. Grainger, father of Charles F. Grainger, president of the company, and was incorporated under the present name 25 years ago, with $100,000 capital stock. Later the capital was increased to $200,000. W. C. Brohm is vice-president and general manager and John M. Upton secretary and treasurer.

Almost 1000 acres of land has been purchased by the Bethlehem Steel Company in the neighborhood of its plant at Sparrows Point, Md., since May 1.

CO-OPERATION BY ENGINEERS

A New Organization on Foot to Take Part in Civic Affairs

A movement which looks to the formation of a new organization of engineers who are represented in the membership of the large national engineering societies was set on foot at a luncheon given at the India House, New York, on Sept. 28 by William L. Saunders, chairman of the Ingersoll-Rand Company. About 35 persons were present, including officers of the societies. Mr. Saunders in bringing before his guests the object of the gathering said that the complete organization of engineers for civic work—the committee of five in each State — created by the National Consulting Board through its Committee on Industrial Preparedness, had suggested the desirability of a permanent organization of engineers to work in the same and kindred lines. The work done in making an inventory of the country's manufacturing and raw material resources had resulted in the creation by Congress of a Council of National Defense. What was now advisable, in the opinion of Mr. Saunders and others with whom he had consulted, was the formation of the National Association of Engineers, or the National Federation of Engineers, or the Engineers' Civic Association — whatever name might be adopted—to which members of the national societies might belong, its purpose being to bring the engineer forward to a position of influence and service in the affairs of government. There was no thought of connecting the new association with the technical work carried on by the existing societies, but, entirely independent of them, it should be in a position to make the influence of engineers felt when Congress is considering conservation of our natural resources, mining laws, railroad regulation and like questions.

The views of most of those present were expressed, the discussions being participated in by Dr. L. H. Baekeland, Frank J. Sprague, Dr. A. R. Ledoux, Lawrence Addicks, Charles F. Rand, Dr. Charles H. Herty, president of the American Chemical Society; Gano Dunn, J. J. Carty, H. W. Buck, president of the American Institute of Electrical Engineers; Dr. D. S. Jacobus, president of the American Society of Mechanical Engineers, and Calvin W. Rice, secretary of that society; Dr. H. S. Drinker, president of Lehigh University; Charles Whiting Baker and Charles Warren Hunt, secretary of the American Society of Civil Engineers.

The expressions were almost entirely favorable to the proposals as presented by Mr. Saunders. The point was made that the constitutions of most of the existing engineering societies prevent the consideration by those societies of political and other public questions, and therefore engineers had no organization through which they could act in civic affairs. Reference was made by some of the speakers to other movements now under way designed to secure co-operation of important questions among the country's scientists and members of technical societies.

The outcome of the discussion was the unanimous adoption of a resolution providing for the appointment of a committee of five by Mr. Saunders to consider the various proposals made at the meeting and to make a report at another meeting to be called by the chairman. The committee consists of Benjamin B. Thayer, Charles W. Hunt, Thomas Robbins, John J. Carty and Calvin W. Rice.

The Doehler Die-Casting Company, Court and Ninth streets, Brooklyn, N. Y., was incorrectly located at Rochester, N. Y., on page 677 of THE IRON AGE of Sept. 21, in giving an abstract of the paper presented before the American Institute of Metals at Cleveland on "The Evolution of the Die-Casting Process," by Charles Pack of that company. The error was originally made in the official program of the Institute.

Zinc is the leading metal produced in French Indo-China and its exportation in the past five years from Haiphong has averaged nearly 27,000 metric tons per year. In 1913 the total was 27,732 tons; in 1914 it was 19,562 tons, and in 1915 it was 33,335 tons. Of the latter the United States took 7825 tons.

ESTABLISHED 1855

THE IRON AGE

EDITORS:
A. I. FINDLEY
GEO. W. COPE W. W. MACON
CHARLES S. BAUR, *Advertising Manager*

Published Every Thursday by the DAVID WILLIAMS CO., 239 West Thirty-ninth Street, New York

W. H. Taylor, *Pres. and Treas.* Charles G. Phillips, *Vice-Pres.* Fritz J. Frank, *Secretary* M. C. Robbins, *Gen. Mgr.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: Park Building. Boston: Equitable Building. Philadelphia: Real Estate Trust Building. Cleveland: Guardian Building. Cincinnati: Mercantile Library Building.

Subscription Price: United States and Mexico, $5.00 per year; single copy, 20 cents; to Canada, $7.50 per year; to other foreign countries, $10.00 per year. Entered at the New York Post Office as Second-class Mail Matter.

The Pig-Iron Outlook

What of pig iron? Will the demand from abroad, by which the seemingly impending break in the market was so narrowly averted, be the agency that shall carry pig iron in the wake of other metals to a high level of prices? The factors likely to influence the trend of pig-iron prices are partly speculative and partly capable of analysis.

It was only two months ago that a break in the foundry-iron market seemed imminent. A country-wide demand for castings existed and many foundries had filled their order books in excess of capacity. Then why a weak pig-iron market? Because of labor strikes, labor inefficiency and indifference, and irremediable labor shortage, foundry production had been cut down as much as 25 to 30 per cent. Pig iron had been bought for first half delivery on the basis of full foundry production. When deliveries came due, many buyers could not take in the iron, in some cases finding themselves even without labor to unload the cars in the yard. As a result, furnaces saw their entire schedules disarranged and themselves under the necessity of putting over into the last half large amounts of contract iron, while the foundries were also carrying considerable stocks on their yards. In the last half the effects have been cumulative. At the present time, though the midsummer uncertainty regarding the first half of 1917 has been relieved, not a few merchant furnaces could take orders for last quarter shipment with advantage to themselves. To some extent this gap will be filled by the heavy domestic demand for steel-making iron and by shipments of iron for export.

What is said above of the foundry labor situation as the limiting factor is important in its bearing on the future. In the coming year little improvement in this respect is probable, and, from domestic consumption of pig iron thus hampered, producers of foundry irons are not likely to find support for more than a competitive market. Some compensation is to be expected from foreign demand. Merchant pig iron is being produced approximately at the rate of 10,000,000 tons annually, of which about 6,500,000 tons will be foundry iron. Assuming the enforced curtailment of foundry consumption to be 20 per cent, we have some suggestion of the amount of iron that must be sold abroad to take up all the output at home. Pig iron is being exported most largely to Norway, Sweden, Holland, Russia, France and Italy, and latterly Great Britain has been a buyer. Italy and France are the most likely markets. Italy has been buying at an exceptional rate of both foundry and steel-making irons, but the most liberal allowance on account of abnormal needs suggests no very large figures. Exports of pig iron from this country in 1913, the year of highest record up to that time, amounted to 277,648 tons. While Europe primarily desires steel and her purchases of pig iron are largely supplementary, yet if we assume the same increase in demand for pig iron as has been shown in exports of steel as between like periods in 1913 and 1916, namely, about 150 per cent, we arrive at possible exports of pig iron in 1916 in the neighborhood of 700,000 tons. This is less than one month's production of the merchant stacks and is considerably under the amount by which the expected domestic market of the furnaces has fallen short.

Something may be counted on in the pig iron that will be bought for the open-hearth steel capacity steadily being added by new works and additions. This year, however, in spite of the large amount of new open-hearth plant started up, there was no particular change in the price of steel-making pig iron until the foreign demand set in, nor was foundry iron noticeably affected by the swinging of foundry-iron furnaces to steel-making pig iron.

The extent to which pig-iron prices may advance for reasons related to the supply and cost of raw materials is a matter of some speculation. Under favorable conditions for the Lake movement of ore, the indications are that the supply during the coming winter is likely to be sufficient only by a narrow margin. The loss of a half month's shipment, equivalent to nearly 5,000,000 tons of ore, or 2,500,000 tons of pig iron, would completely dwarf the bearing of export demand upon the situation. A shortage of 100,000 tons of pig iron would be more effective in advancing prices than unsold stocks of 1,000,000 tons in depressing them.

In the matter of costs, expectations of advances are sustained by every indication. Increases in Lake freights of perhaps 20 cents per ton and in the price of ore of 75 cents or more are within the probabilities. Coke operators also are contending against labor conditions for which no relief is in sight, and already production is falling behind

contract obligations, with contracts for 1917 being made at higher prices. If all the expected advances in costs of raw materials become effective, the question still remains whether pig-iron producers will absorb them out of their profit or add them to the selling price. Sales already made for the first half show only a partial addition of expected advances in raw materials to the pig-iron prices of 1916.

The Engineer in the Ascendency

Some big developments are under way looking to giving to the engineer that place in society which he feels should have been his long before this. One of these is growing out of the industrial preparedness movement; another is the crystallization of the industrial service and research idea which took root on the establishment by Ambrose Swasey of the Engineering Foundation; and the third, as yet unannounced, seems to seize on the need of a single organization to secure that broad recognition for science, applied as well as pure, that will gain weight for views of the engineer in matters of public concern, for example.

It is not surprising that such movements should be taking form when a survey is made of the caliber of intellect and kind of personality which have now for years been taking up in numbers the engineering profession. The public, moreover, has been gaining regard for the engineer rapidly. His plentiful works of magnitude, complexity and daring have earned it. As a primary help in legislative or administrative work, at least in a public way, however, he has not come in for much consideration. He has stuck to his last, as a class; without commercial training, he has not studied to establish himself as an oracle or to lift the market price for his services. It has been left to those of the broadest attainments, ranking in their profession, to foresee the tendencies of big import. And results are likely to be realized through their avenues of activity long before they are through the endeavors of the workers for self-interest. In this last class will the world put the no less than three associations started last year, and made up largely of employee-engineers, who, through co-operative effort, hope to get compensation increases apparently through force of numbers. The public, which, after all, pays the bill, needs further education before it will fully appreciate engineering service, and then there should be less complaints of inadequate rewards.

The possibilities of a new association perpetuating the public-spirited work of the nation's industrial census are noted elsewhere in this issue. The working groups in each State of members of the four large national engineering societies and of the American Chemical Society completed their special task, accepted from the Committee on Industrial Preparedness of the Naval Consulting Board, when the facts and figures reached Washington; and they lost their wageless jobs when Congress arranged for a National Council of Safety, this made up of members of the President's Cabinet and of some seven appointed experts in different industries, public utilities, etc. The engineering societies, not having rights under their charters to take action on Government affairs, the opportunity was taken to look into the feasibility of continuing the co-operative movement through the medium of an association to devote itself to public matters involving engineering, as in problems of conservation, railroad regulation, and mining laws. The next step will come after the report of the committee appointed by Mr. Saunders.

A demand for a single strong, influential body is shown in the growing belief that one general engineering society could well serve, and now, it is understood, a plan is on foot to reach beyond applied science and take in the pure scientist. More need not be said of this now, as announcements in this regard are expected within the next few days. Such a step forward, however, pushed by men of authority and position, and shaping itself at the same time with the engineering-civic association, ought to reassure the doubters that the world will not undervalue its engineers.

Finally, as a contemporaneous development, may be mentioned an advanced step which has been taken in connection with the Engineering Foundation. Here it seems that a national research council is under formation to coördinate the research facilities of the Government and commercial and private laboratories. It is made up in part of members of the National Academy of Sciences, and will be provided with the machinery of the Foundation, for which, incidentally, Dr. Cary T. Hutchinson, a noted consulting engineer of New York, has been secured as secretary. If this last is to become the instrument for investigating the unknown for the sake of industry, started by one engineer and continued by others, surely the engineer must feel that he is coming into his own, and fast at that. Through the last institution he is guiding industry in uncharted fields; through membership in the national security council he will put his special knowledge at his country's service; through his new proposed get-together organization he proposes to advise, if not to direct, the Government in matters essentially technical, and through his scientific legion of honor he will be admitted among the immortals.

A Remarkable Coke Market

The Connellsville coke market has run quite counter to expectations. For a year or more the theory in the coke market has been that as additional by-product ovens were completed coke prices should decline. A year ago contracts were made for the present year at an average of between $2.25 and $2.35 per net ton at oven, but at practically all times there were slightly lower prices quoted for the whole year than for the first half, on the principle that increased by-product oven production would make coke more plentiful in the second half than in the first half. When contracts came to be made for the second half of this year, however, the average was in the neighborhood of $2.50, representing an advance rather than a decline, while now the expectation is that contracts for the first half of 1917 will be at $3 or more.

The building of by-product ovens has, in fact, ceased to be the controlling factor. One item is that the by-product ovens are being completed much

more slowly than was expected, as the labor shortage has curtailed building operations, while materials and equipment are secured with difficulty. The more important influences now are the coal market and the shortage of labor at the coke ovens. Such prices are obtainable for coal that it does not pay to make coke at all except at the higher coke prices. The labor supply is so scant that production of coke is restricted; the scarcity is of coke workers rather than of coal miners.

In the tense condition that exists it does seem that the making of coke contracts for the first half of next year, at any price, represents a gamble on both sides. If there were an adequate supply of labor, coke would not be so high as it is; but with labor scarce now and perhaps unobtainable six months hence, the operators may be unable to carry out contracts, no matter what the price.

Our Huge Crude Steel Exports

The extent to which the United States is supplying Europe with steel billets, ingots and blooms is phenomenal, being little appreciated by the average reader. Exports of these steel products from the United States are now at the greatest rate ever recorded and still on the increase. To Aug. 1, 1916, the total this year was 647,566 gross tons or 92,509 tons per month. In January they were only 55,315 tons, growing to 107,696 tons in March, 142,782 tons in May, the maximum thus far. The following table of Government data shows the relative exports in gross tons:

	Total	Per Month
Seven months to Aug. 1, 1916.....	647,566	92,509
Fiscal year ended June 30, 1916..	962,206	80,184
Fiscal year ended June 30, 1915..	220,416	18,334
Fiscal year ended June 30, 1914..	46,926	3,827
Calendar year 1915.....	560,728	46,727
Calendar year 1914.....	50,496	4,208
Calendar year 1913.....	91,847	7,654

The present exports are at the rate of 1,110,108 gross tons per year, and compare with only 91,847 tons in 1913 as the previous pre-war record.

The destination of these exports for the fiscal year ended June 30, 1916, was as follows:

	Gross Tons
France	571,767
United Kingdom	240,802
Canada	92,597
Other countries	57,040
Total	962,206

France took 80,116 tons of the June total of 116,425 tons and is now absorbing the bulk of the exports from this country. Earlier in the war, France received practically no billets, ingots or blooms, the greater part going to the United Kingdom. Out of total exports in 1915 of 560,728 tons, Great Britain took 359,125 tons, Canada 58,486 tons and other countries 143,117 tons, France receiving none. The course of the shipments of this class of material has decidedly changed in six months.

The Tungsten Market

The tungsten market is more active. Large sales of concentrates for next year's delivery have been made at about $17 per unit for 60 per cent ore. At least 200 tons of ferrotungsten has also been sold, part of it for foreign consumption, England being the principal purchaser. The price paid was $2.60 to $2.75 per lb., New York, of contained tungsten. An incident connected with England's purchase is that one lot was taken from an American producer whose name appears on the British supplementary black list.

The Bolt and Nut Cash Discount

Through inadvertence an erroneous statement was printed in last week's issue of THE IRON AGE regarding the cash discount on bills for bolts and nuts. It was stated that "about 50 per cent of the larger bolt and nut manufacturers have notified A. H. Chamberlain, secretary of the American Iron, Steel and Heavy Hardware Association, New York City, that they will continue to allow a 2 per cent discount for bills paid within 10 days after presentment." The correct situation in this respect is as presented below in an extract from the association's journal, the *Heavy Hardware Bulletin* for September:

> All branches of the jobbing trade have made themselves distinctly heard against the proposal of certain manufacturers of bolts and nuts to reduce their cash discount on this line from 2 per cent—10 days to 1 per cent—10 days. The progress that has been made is indicated by the fact that the secretary has expressions from six of the ten or twelve manufacturers who are recognized as largest servers of the jobbing trade, stating that they will allow 2 per cent cash discount as heretofore. With this percentage against it, it is hard to see how the movement to reduce the cash discount on this line can be pushed to ultimate success.

The above statement is of course made from the standpoint of the jobbers and refers specifically to the manufacturers of bolts and nuts who cater especially to the jobbing trade. The greater number of bolt and nut manufacturers, however, sell their product to agricultural implement makers, machinery builders and other consumers, and this class of trade claims to be wholly on the 1 per cent basis, with no disposition to return to the old 2 per cent discount. The 1 per cent discount was put into effect early in the present year. The bolt and nut manufacturers are confident that 90 per cent of the important manufacturers in their line are adhering strictly to the discount of 1 per cent for cash in 10 days from the date of invoice.

Open-Hearth Furnace Record at Harrisburg

The No. 2 basic open-hearth furnace at the works of the Central Iron & Steel Company, Harrisburg, Pa., rated at 50 tons, gave 880.4 gross tons of finished ingots in the week ended Oct. 1. What makes the record all the more noteworthy is that the ingots were bottom poured, as is the entire output of the plant, and the record was made with producer gas and cold stock. William H. Brown is superintendent of the open-hearth department.

The company is proceeding with the construction of a 100-ton furnace. Robert H. Irons, general superintendent, expects that steel will be made in it by June or possibly July. After the completion of this furnace the 50-ton furnaces are to be changed to 100-ton units, making a battery of five 100-ton furnaces in all, which are calculated to give sufficient steel to operate the company's present mills to full capacity.

Locomotive Buying and Inquiry

Locomotive buying and inquiry are both more active. Since the large order for 230 locomotives placed two weeks ago by the New York Central, orders for 34 locomotives have been reported, made up of small orders from numerous sources, of which 10 are for export and 4 for the Bethlehem Steel Company. The American Locomotive Company and the Baldwin Locomotive Works will build 5 each of the foreign locomotives. The Baldwin Locomotive Works will furnish the Bethlehem Steel Company with 4 switching and the Midvale Steel Company with 2 locomotives. Inquiries have appeared for 54 locomotives, the largest being 10 Santa Fes for the Union Pacific, 13 for the Pere Marquette, 10 for the Nashville, Chattanooga and St. Louis and 8 for the Norfolk & Western.

The Dominion Steel Corporation of Canada will call in and pay off all renewal balances of short term obligations, consisting of $3,400,000 five-year 6 per cent notes. The notes do not fall due until Dec. 1, 1918, and thus their maturity is anticipated by two full years.

PERSONAL

E. H. Gary, chairman of the United States Steel Corporation, has returned from an Asiatic tour. In an interview with newspaper representatives, he speaks highly of Japanese manufacturing and commercial enterprise.

H. B. Allen, who has long been connected with the sales department, has been appointed domestic sales agent for the American Iron & Steel Mfg. Company, manufacturer of bar iron, bolts, nuts, rivets, etc., Whitehall Building, New York City. George H. Court has been appointed export sales agent.

Henry J. Klaer has been made general manager of the Penn-Seaboard Steel Corporation of Philadelphia. He was formerly engineer for the Thurlow, Pa., plant of the American Steel Foundries and recently has been treasurer of the Wetherill Company, Chester, Pa., now a part of the Sun Shipbuilding Company.

Effective Oct. 1, T. Burns, general superintendent of the open-hearth steel plant of the Pittsburgh Crucible Steel Company, Midland, Pa., resigned, and that position was abolished. On that date William G. O'Malley assumed the duties of works manager, having charge of all operations and construction at Midland, reporting directly to the president, J. W. Daugherty. Mr. O'Malley has been general master mechanic of the plant for five years. He was for some years connected with the Lackawanna Steel Company, and superintended the construction of the new plant of that company at Buffalo, N. Y.

W. E. Donaldson, who recently resigned as superintendent of the department of transportation and labor at the Ohio works of the Carnegie Steel Company, Youngstown, to become special agent for the United States Steel Corporation, in charge of the slag department, with headquarters at Pittsburgh, was given a dinner by his former associates at Youngstown last week, and was presented with a diamond stick pin and a pair of cuff links. He assumed his new duties in Pittsburgh, Oct. 2.

William Griffin, recently appointed superintendent of the transportation and labor department of the Ohio works of the Carnegie Steel Company, Youngstown, was presented last week with a gold watch, chain and elk tooth charm, by employees of the safety department, from which he resigned recently to accept his new position.

W. R. Pendry, formerly connected with the by-product coke department of the Minnesota Steel Company, Duluth, Minn., has been placed in charge of new by-product coke construction of the American Steel & Wire Company, Cleveland, Ohio.

R. E. Priest, formerly sales manager of the Garland Nut & Rivet Company, Pittsburgh, has resigned to become general manager of sales of the McLain-Heames Company, Detroit, Mich., manufacturer of cap, set and stud bolts, semi-finished nuts and automobile nuts.

Following the resignation of H. A. Flagg, sales manager of the Standard Welding Company, Cleveland, and Charles E. Miller from the management of the Detroit office of the same company, J. C. Manternach, general manager of the company has made public the following appointments and promotions, all effective Oct. 1: P. W. Gilbert, who has been assistant sales manager for nearly five years, takes up the duties of manager of sales. B. A. Quayle, who has had charge of the Chicago office for many years, becomes general representative, with headquarters at the factory. Benton G. L. Dodge, who has had charge of advertising and publicity for more than five years, takes up the larger duties of manager of sales promotion. Walter C. Voss, formerly in charge of the Cleveland district, moves to Detroit, where he will assume charge jointly with Theodore Palmer, long connected with the Michigan office. Willis Stutson, of the Indianapolis district, is placed in charge of the Chicago office, with A. J. Brandt as assistant. Mr. Stutson will also handle the Indianapolis district from Chicago. O. L. Miller, formerly of the order department at the factory, replaces Mr. Voss at Cleveland. T. E. Hauser, formerly head of the order department, becomes assistant to the sales manager, while W. Paxton becomes head of the order department. Neither Mr. Flagg nor Mr. Miller has yet announced his intention regarding a future business connection, but it is generally understood that they will engage in business jointly in Detroit.

L. C. Schultz has become associated with Hamilton & Hansell, 17 Battery Place, New York, as metallurgist on ferrotungsten in the Rennerfelt electric furnace department.

George W. Hughes, general superintendent of the Earlston and Saxton furnaces, is at Iron River, Mich., inspecting the ore properties operated by Joseph E. Thropp, Everett, Pa.

Paul J. Barnard, Minneapoils, Minn., has been appointed sales manager of the Harvey Spring & Forging Company, Racine, Wis., which is extending its business and production. He was formerly connected with the Gas Traction Company, Minneapolis, and later with the Emerson-Brantingham Company, Rockford, Ill. In recent months he was Northwestern distributing agent for Burd piston rings and Harvey springs.

George A. Dechant, Harrisburg, Pa., has been appointed advertising manager of the J. I. Case Threshing Machine Company, Racine, Wis. He has been a member of the Case sales organization for nine years, serving as branch manager at Harrisburg the last six years.

John Strondeck, superintendent of the Joliet plant of the Joliet Bridge & Iron Company, Joliet, Ill., has been transferred to DePere, Wis., to take charge of the former Lyons Boiler Works, recently acquired by the Joliet company as a branch. The Lyons works is now being overhauled.

Samuel P. Goman, formerly superintendent of the Harlan & Hollingsworth Corporation, Wilmington, Del., is now superintendent of the new Sun Shipbuilding Company, Chester, Pa.

R. F. Randolph, who has been general superintendent of the Saucon plant of the Bethlehem Steel Company, has been appointed general superintendent of the Dominion Iron & Steel Company, Sydney, N. S.

G. J. Buckeye has severed his connection with the Buckeye Machine Company, Ltd., manufacturer of agricultural implements and general machinery, Calgary, Alberta, and expects in the near future to be in business for himself.

T. V. Buckwalter, formerly of the engineering department of the Pennsylvania Railroad Company, Altoona, Pa., has been appointed chief engineer of the Timken Roller Bearing Company, Canton, Ohio. His specialty in connection with the Pennsylvania Railroad was in self-propelled vehicle research work in connection with the development of motor car practice.

Will H. Baltzell has been appointed chief engineer of the Canadian Steel Corporation, Ltd., with offices at Ojibway, Ontario, Canada. This is the Canadian branch of the United States Steel Corporation.

W. L. Cooper, London representative of Robert W. Hunt & Co., Chicago, is in the United States visiting the various offices of his principals and acquainting himself with current conditions.

The Hart & Hutchinson Company, New Britain, Conn., has accepted the resignation of Guy Hutchinson as secretary and treasurer. The election of officers resulted as follows: Howard S. Hart, president; Maxwell S. Hart, vice-president; Norman P. Cooley, treasurer; Logan E. Page, secretary. Mr. Hutchinson will continue as a member of the board of directors. He will take up new duties with the Willys-Overland Company in New York City.

C. E. Williams, general manager of the William L. Gilbert Clock Company, Winsted, Conn., has also been made secretary of the company, succeeding Harvey L. Slauson, who has resigned to accept a position with

the American Graphophone Company, Bridgeport, Conn.

I. Schoenawa has become associated with the Charleston Steel Company, Charleston, W. Va., as managing director. He was formerly connected with Siemens & Halske and was in charge of the installation and operation of the large 20-ton electric induction steel furnaces at the plant of the American Iron & Steel Mfg. Company, Lebanon, Pa. Mr. Schoenawa is well-known as one of the authors of an important German work on electric steel furnaces. The Charleston company will soon start up an 8-ton Rennerfelt electric furnace.

Charles Lounsbury has been elected president and general manager of the American Railway Supply Company, 134-136 Charles Street, New York, to take the place of the late Walter Chur, who died Aug. 29, 1916, at his home in East Orange, N. J.

S. B. Patterson has resigned as superintendent of the properties of the Robesonia Iron Company, Ltd., Robesonia, Pa., effective Oct. 1, after 12 years of service with the company. It is his intention to retire from active business. Starting as a clerk at the blast furnaces of Cooper, Hewitt & Co., Phillipsburg, N. J., in 1864, Mr. Patterson successively engaged in the manufacture of stoves at Phillipsburg and in the operation of blast furnaces at Ironton, W. Va., Pine Lake, Mich., West Point, N. Y., Quinnemont, W. Va., Wharton, N. J., and Catasauqua, Pa. In 1904 he left the Empire Steel & Iron Company and was appointed superintendent of Robesonia furnace. He will reside at Allentown, Pa. Mr. Patterson's successor is J. W. Gocher, formerly of Johnstown, Pa., who began his career in the iron and steel business in 1889, as a draftsman in the employ of the Cambria Steel Company, becoming successively chief draftsman, assistant chief engineer, and chief engineer of the company, and in 1912 was transferred to the executive department as consulting engineer and assistant to the president. In 1914 he left the Cambria Company to establish an office of his own in Johnstown as consulting engineer in which capacity he became known to the Robesonia Iron Company, and in April of this year was offered and accepted the position of assistant superintendent.

Robert C. Clifford, for the past four years district sales manager for the United States Cast Iron Pipe & Foundry Company, in charge of its St. Louis and Kansas City offices, is now associated with the Walter A. Zelnicker Supply Company, St. Louis, in charge of its rail department.

R. W. Howell, formerly with the Springfield Machine Tool Company, Springfield, Ohio, has been appointed foundry superintendent of the Miller Improved Gas Engine Company in the same city.

W. L. Buck, who has been connected with the Cambria Steel Company, Cincinnati, Ohio, has resigned to accept a position in the sales department of the American Steel Export Company, New York City.

Frank A. Moeschl, general manager of sales of the Newport Rolling Mill and Andrews Steel companies, Newport, Ky., has returned from a five weeks stay on the Pacific coast.

E. J. Cornish, vice-president, has been elected president of the National Lead Company, succeeding W. W. Lawrence, deceased, late of Pittsburgh.

The Vulcan Steel Products Company, 120 Broadway, New York, the new export company established by Otto Kafka, has on its staff the following: William W. Weller, representative in France, whose experience covers years of active work in the steel industry, including several years as sales manager for one of the largest pipe manufacturing concerns in America; F. G. Belsito, representative abroad, especially in Italy, whose experience covers selling in Cuba, Panama and Italy; George W. Blen, representative in England, whose experience has been gained in years of active work in various departments of the steel industry; Fred M. Cole, at the head of the purchasing department, whose experience has especially been in the manufacturing department of the Cambria Steel Company; Warren M. Maule, secretary and active head of the accounting department, who has been assistant in the comptroller's office of the Cambria Steel Company; and H. D. Mills, head of the traffic department, who has had long experience in various railroad and express companies.

J. B. McIntyre, superintendent of the St. Louis warehouse of the Illinois Steel Company, has been appointed assistant to the general superintendent at North works, Illinois Steel Company, Chicago. He is succeeded at St. Louis by W. C. Strand of the sales department of the Illinois Steel Company at Chicago.

Joseph Spring, for the past seven years piece rate inspector, factory lay-out and cost department, for the Aurora Automatic Machinery Company, Aurora, Ill., has been promoted to the position of superintendent of the Chicago plant of the company, effective Oct. 1.

The Trumbull Steel Company, Warren, Ohio, has transferred R. B. Ohl from the general sales department at the mill to the Eastern district sales office, Grand Central Terminal, New York City.

S. R. Willock has been appointed general manager of sales of the William Tod Company, Youngstown, to succeed R. D. Day, who resigned recently to become connected with the Pollak Steel Company, Cincinnati. Mr. Willock for some time has been assistant general manager of sales.

OBITUARY

COL. ROBERT C. MCKINNEY, chairman of the board of directors of the Niles-Bement-Pond Company, 111 Broadway, New York, died at his home at Belle Haven, Conn., Oct. 3, aged 65 years, following an illness of more than two years. It was because of failing health that Colonel McKinney gave up the active work attached to the presidency of the company in February, 1915. He had been connected with the manufacture of machine tools since he was 20 years old. He was born in Troy, N. Y., but went to Hamilton, Ohio, when a young man. He was one of the organizers of the Machinery Club of the City of New York, and at the time of its organization was made vice-president. He was elected president of the club in 1909 and served two years. At the time of his death he was a director. He leaves his widow, a daughter, a brother—J. P. McKinney of Pittsburgh—and two sisters.

SAMUEL POWELL STACKHOUSE ELLIS died at his home in Pittsburgh, Sept. 28, aged 66 years. He was born in Philadelphia and was graduated from the Philadelphia High School. In 1870 he went to Johnstown, Pa., as private secretary to Daniel J. Morrell, general superintendent of the Cambria Iron Company. He was connected with that company for 19 years, when he resigned to accept the position of sales manager for the Pittsburgh district of the Lorain Steel Company, which position he held for 23 years, resigning Feb. 1, 1912. He leaves his widow, one son and three daughters.

CHARLES FORNEY, former superintendent of the blast furnaces of the old Paxton Iron & Steel company, Harrisburg, Pa., died at his home at Craighead Station, near Carlisle, Pa., Oct. 1, aged 60 years. He was graduated from Lafayette College in 1879 and a year later became connected with the Lebanon blast furnace. Later he went to Virginia, then to Everett, Pa., and next to Sheridan, Pa., in charge of blast furnaces. He became superintendent of the furnaces at Harrisburg in 1894, retiring in 1903.

IGNATZ GRIMM, president Grimm Iron Works, Cincinnati, Ohio, died Sept. 30, aged 73 years. He was a native of Germany and came to this country with his parents when very young. He leaves his widow, one son and two daughters.

Big Deal in Brazilian Manganese Ore

A sale is reported of about 200,000 tons, for shipment over 1917, of standard quality Brazilian manganese ore running about 48 per cent, at two shillings, English money, or 48 cents, per unit of manganese, delivered f.o.b. steamers, Rio de Janeiro; buyers to furnish vessels, and entire freight to be for buyers' account. At the present freight rate of $12 per ton the cost would approximate 75 cents per unit f.o.b. cars, Baltimore.

If current freight rates were figured, this transaction would involve an ultimate expenditure of about $6,750,000. It follows that only a very large interest could finance such a deal, and that the buyer must command the necessary steamers to bring the ore to this country. There is indicated a firm belief on the part of the buyer that the European war has many months to run, and that early relief is not to be expected, in the matter of manganese ore, from Russia or India. The Russian supply is bottled up by the closing of the Dardenelles, while the scarcity of ocean bottoms and Great Britain's restrictions make the shipments from India almost negligible. Small lots of Indian ore have arrived here recently, coming as a part of general cargoes, and have brought from 65c. to 70c. per unit.

Bethlehem Sales Agents in Conference

The entire sales force of the Bethlehem Steel Company was last week called to the home offices at South Bethlehem, Pa., for a conference which lasted three days and included a tour of inspection of the Lehigh and Saucon plants and the recently acquired properties at Sparrows Point, Md., and Steelton, Pa.

Following inspection of the home plants, Sept. 27, the salesmen were guests at a banquet given by General Sales Agent E. S. Knisely at the Lehigh Country Club in the evening, where short addresses were made by President E. G. Grace, Vice-President W. F. Roberts, G. H. Blakeley, manager of structural sales, H. E. Lewis, assistant superintendent, and W. S. Rutherford, manager of orders. In the party were:

Edward S. Knisely, general sales agent; Paul Mackall, assistant general sales agent; R. W. Gillispie, assistant general sales agent; H. A. Jackson, sales agent, Boston district; J. M. Ellis, sales agent, New York district; W. B. Kennedy, sales agent, Philadelphia district; J. A. Davis, sales agent, Baltimore district; H. W. Eisenhart, sales agent, Pittsburgh district; H. N. Clarke, sales agent, Cleveland district; John S. Hegeman, sales agent, Detroit district; Robert E. Belpknap, sales agent, Chicago district; J. M. Price, sales agent, St. Louis district; Edward S. Illig, sales agent, San Francisco district; Edward J. Krause, sales agent, forgings; G. J. Costello, sales agent, crucible tool steels; E. F. Shaffer, sales agent, drop forgings; W. C. Cutler, sales agent, mill No. 1 products; H. G. Walton, sales agent, steel, iron and manganese castings; C. E. Ryberg, sales agent, brass and bronze castings; H. E. Stoll, sales agent, rails; P. H. Hampson, sales agent, miscellaneous products; N. E. Salsich, sales agent, track department; Robert Gross, sales agent, pig iron department.

The Ontario & Niagara Connecting Bridge Company will build at Niagara Falls a bridge of steel and concrete over the Niagara River for the use of steam and electric railroads, vehicles and pedestrians. It is expected to cost $1,000,000. The structure will span the river near the point where the transmission line of the Niagara, Lockport & Ontario Power Company crosses the rapids, in the town of Lewiston, and not far from the whirlpool.

A French metal syndicate, similar to the Metallgesellschaft of Frankfurt, Germany, is about to be formed under the auspices of the French branch of the Penarroya Company, according to *L'Usine* of Paris. This company owns the great lead works in Spain and is said to be controlled by the Rothschilds.

CONTENTS

How a Worcester Plant Controls Production 747
Press for Briquetting Metal Turnings 753
A Safety Manual for Blast-Furnace Workers 753
British Imports of Manganese Ore 753
Finishing Edges of Dies 754
A Semi-Universal Milling Attachment 755
Franklin Institute Lectures 755
A Steel Plant for Siberia 755
Effect of Sulphur on Low-Carbon Steel 756
Salvaging Rails with a Motor Truck 758
Carriage Builders Hold Annual Meeting 758
Suggested Standard for Pattern Parts 759
Grinding Machine with Inclosed Motor 759
The Production of Sound Steel Ingots 760
Cast-Steel Shells Successfully Made Here 762
A New Distant Recording Thermometer 762
A Quenching Machine 763
Vanadium and Tungsten from Peru 763
The Determination of Foundry Costs 764
British Made Pipe 766
British Standard Specifications in Foreign Tongues 767
Grinding Machines for Hack-Saw Blades 767
A Special Lathe for Projectile Work 768
Ferromanganese Alloys by Electricity 769
Three-Cutter Boring Head for Shells 769
Producer Gas for Boilers 770
A Pneumatic Pedestal Riveting Machine 770
Foundry By-Product Coke 771
Two Conventions of American Chemists 772
Iron and Steel Institute's St. Louis Meeting 777
The Russian Steel Industry 777
Plate Mill for Japan 777
Koppers Coke Ovens at Steelton 777
Corrosion of Steel Sheets 778
Rhotanium, a Substitute for Platinum 778
An Electric Steel Induction Furnace at Cleveland 778
Pittsburgh Steel Company's Year 779
Co-Operation by Engineers 779
The Pig-Iron Outlook 780
The Engineer in the Ascendency 781
A Remarkable Coke Market 781
Our Huge Crude Steel Exports 782
The Tungsten Market 782
The Bolt and Nut Cash Discount 782
Open-Hearth Furnace Record at Harrisburg 782
Locomotive Buying and Inquiry 782
Personal 783
Obituary 784
Big Deal in Brazilian Manganese Ore 785
Bethlehem Sales Agents in Conference 785
Government Steel Awards for Navy 785
More Furnaces in Blast 786
Blast Furnace Notes 787
Midvale Stockholders Get Good Report 787
Iron and Steel Markets 788
Iron and Industrial Stocks 799
Export Rates Not Advanced 799
New Railroad Line on Ohio River 799
Finished Iron and Steel Prices, Pittsburgh 800
Metal Markets 801
August Exports and Imports 802
Pittsburgh and Nearby Districts 802
New Strip Steel Plant in Massillon 803
Strikes and Settlements 803
Machinery Markets and News of the Works 804
New Trade Publications 812

Government Steel Awards for Navy

WASHINGTON, D. C., Oct. 3, 1916.—On the basis of bids opened by the Navy Department, Sept. 19, for steel plates, sheets, bars and shapes, and steel hull rivets for the fuel ship to be built at Boston and the hospital ship to be built at Philadelphia, the following awards have been made:

Carnegie Steel Company, 5,400,000 lb. steel plates, $167,346; 178,000 lb. steel plates, $5,775.22; 1,105,400 lb. angles, steel, $68,317.39; 940,000 lb. steel plates, $29,694.60; 6,180,000 lb. steel plates, $189,046.20; 890,000 lb. steel plates, $28,715.10.

Alan Wood Iron & Steel Company, 59,000 lb. sheets, steel, $2,065.

American Sheet & Tin Plate Company, 51,000 lb. sheets, steel, $2,029.80.

American Pressed Steel Company, 60,000 lb. plates, ribbed, steel, $2,448.

Federal Steel Foundry Company, 146,300 lb. steel castings, $14,264.25.

MORE FURNACES IN BLAST

An Increase in Daily Rate of 3400 Tons

September Output Almost Equals That of August —A Net Gain of Nine Stacks

The September pig-iron production was almost the same as that of August. The total for the month was 3,202,366 tons, or 106,745 tons a day as compared with 3,203,713 tons in August, or 103,346 tons a day. The changes caused by the blowing in and blowing out of furnaces gave a net gain of nine stacks. The number on the active list Oct. 1 was 328, with a daily capacity of 106,578 tons, as compared with 319 furnaces active on Sept. 1 with a daily capacity of 104,502 tons.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from September, 1915, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel Works	Merchant	Total
September, 1915	70,977	24,108	95,085
October	73,595	27,227	100,822
November	73,282	27,962	101,244
December	73,647	29,686	103,333
January, 1916	72,614	30,132	102,746
February	75,305	31,151	106,456
March	76,274	31,393	107,667
April	77,226	30,366	107,592
May	77,706	30,716	108,422
June	76,526	30,527	107,053
July	74,397	29,620	104,017
August	74,617	28,729	103,346
September	76,990	29,755	106,745

CAPACITY IN BLAST OCTOBER 1 AND SEPTEMBER 1

The following table shows the daily capacity in gross tons of furnaces in blast Oct. 1 and Sept. 1 by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Oct. 1 Number in blast	Oct. 1 Capacity per day	Sept. 1 Number in blast	Sept. 1 Capacity per day
New York:					
Buffalo	19	17	5,747	16	5,395
Other New York	5	3	583	3	550
New Jersey	6	1	230	1	230
Pennsylvania:					
Lehigh Valley	20	13	3,378	13	3,720
Spiegel	2	1	109	2	206
Schuylkill Val.	12	11	3,049	10	2,855
Lower Susquehanna	6	5	1,322	5	1,370
Lebanon Valley	8	6	742	7	835
Ferro and Spiegel	1	1	86	1	90
Pittsburgh Dist.	53	52	23,839	49	22,825
Ferro	3	3	408	3	405
Shenango Val.	19	19	6,176	19	5,944
Western Pa.	24	20	6,014	20	5,841
Ferro and Spiegel	3	2	201	1	100
Maryland	4	4	1,600	3	1,230
Ferro	0	0	0	1	92
Wheeling District	14	14	4,499	13	3,981
Ohio:					
Mahoning Val.	25	25	11,031	24	10,445
Central and Northern	24	21	8,232	22	8,551
Hock. Val. and Hang'g Rock.	15	11	1,608	10	1,550
Ill. and Ind.	35	32	13,563	31	14,812
Ferro	2	1	84	1	60
Michigan, Wis. & Minn.	12	10	2,834	9	2,378
Colo. and Mo.	6	4	1,325	4	1,273
Ferro	1	1	55	1	126
The South:					
Virginia	18	9	1,131	9	1,133
Kentucky	5	3	458	3	450
Alabama	37	28	7,258	29	7,085
Ferro	1	1	59	0	0
Tennessee	15	10	957	9	970
Total	394	328	106,578	319	104,502

The furnaces blown in between Sept. 1 and Oct. 1 include one Buffalo stack in New York, one Saucon in the Lehigh Valley, Delaware River in the Schuylkill Valley, one Edgar Thomson, one Lucy and one Eliza in the Pittsburgh district, Marshall in western Pennsylvania, one Bellaire in the Wheeling district, Cherry Valley in the Mahoning Valley, Hamilton in the Hanging Rock district, one Gary in the Chicago district, one Zug at Detroit and Standard in Tennessee.

Among the furnaces blown out last month were one Saucon and one Palmerton in the Lehigh Valley, one Lebanon in the Lebanon Valley, Newburgh in Ohio, and Helen in Tennessee.

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in September and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	June (30 days)	July (31 days)	Aug. (31 days)	Sept. (30 days)
New York	190,140	190,319	182,812	185,483
New Jersey	6,379	6,621	7,020	6,907
Lehigh Valley	111,689	104,835	99,650	104,989
Schuylkill Valley	93,552	89,811	88,373	91,483
Lower Susquehanna and Lebanon Valley	75,092	73,440	69,558	64,514
Pittsburgh district	728,071	736,477	721,917	724,183
Shenango Valley	172,259	178,903	179,970	185,276
Western Pennsylvania	157,909	169,979	172,970	183,647
Maryland, Virginia and Kentucky	85,687	87,294	92,540	94,382
Wheeling district	125,889	128,135	123,426	124,034
Mahoning Valley	315,675	314,461	326,413	316,907
Central and Northern Ohio	274,526	261,162	263,587	248,434
Hocking Valley and Hanging Rock	48,640	48,624	50,168	43,948
Chicago district	462,394	465,895	460,836	457,637
Mich., Minn., Mo., Wis. and Col.	123,116	121,285	115,341	121,877
Alabama	204,076	213,973	219,076	219,508
Tennessee	33,494	33,299	30,056	29,157
Total	3,211,588	3,224,513	3,203,713	3,202,366

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of steel-making iron month by month, together with ferromanganese and spiegeleisen. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Pig, total production 1914	1915	1916	Spiegeleisen and ferromanganese 1914	1915	1916
Jan.	1,261,430	1,115,944	2,251,035	17,325	18,041	24,866
Feb.	1,329,414	1,237,380	2,183,845	10,524	13,319	23,877
Mar.	1,704,688	1,551,082	2,365,116	20,133	12,274	29,388
Apr.	1,635,226	1,584,111	2,316,768	18,676	12,337	31,862
May	1,457,847	1,694,290	2,408,890	21,504	13,440	35,844
June	1,329,623	1,770,657	2,295,784	16,254	19,200	38,597
July	1,395,851	1,949,750	2,306,303	16,524	17,854	31,353
Aug.	1,455,054	2,101,818	2,313,122	11,577	27,463	33,338
Sept.	1,390,322	2,129,322	2,309,710	13,786	23,159	29,451
Oct.	1,271,820	2,281,456	.....	17,435	23,992	.....
Nov.	1,059,159	2,198,459	.....	21,977	28,741	.....
Dec.	1,034,802	2,283,047	.....	20,733	25,004	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1912—Gross Tons

	1912	1913	1914	1915	1916
Jan.	2,057,911	2,795,331	1,885,054	1,601,421	3,185,121
Feb.	2,100,815	2,586,337	1,888,670	1,674,771	3,087,212
Mar.	2,405,318	2,763,563	2,347,867	2,063,834	3,337,691
Apr.	2,375,436	2,752,761	2,269,655	2,116,494	3,227,768
May	2,512,582	2,822,217	2,092,686	2,263,470	3,361,073
June	2,440,745	2,628,565	1,917,783	2,380,827	3,211,588
July	2,410,889	2,560,646	1,957,645	2,563,420	3,224,513
Aug.	2,512,431	2,545,763	1,995,261	2,779,647	3,203,713
Sept.	2,463,839	2,505,927	1,882,577	2,852,561	3,202,366
9 mo.	21,279,966	23,961,110	18,237,198	20,296,445	29,041,045
Oct.	2,689,933	2,546,261	1,778,186	3,125,491	.....
Nov.	2,630,854	2,233,123	1,518,316	3,037,308	.....
Dec.	2,782,737	1,983,607	1,515,752	3,203,322	.....
Total, yr.	29,383,490	30,724,101	23,049,752	29,662,566	.....

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The figures for daily average production, beginning January, 1909, are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since Jan. 1, 1909 Gross Tons

	1909	1910	1911	1912	1913	1914	1915	1916
Jan.	57,975	84,148	56,752	66,384	90,172	60,808	51,659	102,746
Feb.	60,976	85,616	64,090	72,442	92,369	67,453	59,813	106,456
Mar.	59,232	84,459	70,036	77,591	89,147	75,738	66,575	107,667
Apr.	57,962	82,792	68,836	79,181	91,759	75,665	70,550	107,592
May	60,753	77,102	61,079	81,051	91,039	67,506	73,015	108,422
June	64,656	75,516	59,585	81,358	87,619	63,916	79,361	107,053
July	67,793	69,305	57,841	77,738	82,601	63,150	82,691	104,017
Aug.	72,546	67,963	62,150	81,046	82,057	64,363	89,666	103,346
Sept.	79,507	68,476	65,903	82,128	83,531	62,753	95,085	106,745
Oct.	83,856	67,520	67,811	86,722	82,133	57,361	100,822	.....
Nov.	84,917	63,659	66,648	87,697	74,453	50,611	101,244	.....
Dec.	85,022	57,349	65,912	89,766	63,987	48,896	103,333	.....

The fluctuations in pig-iron production from January, 1908, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local

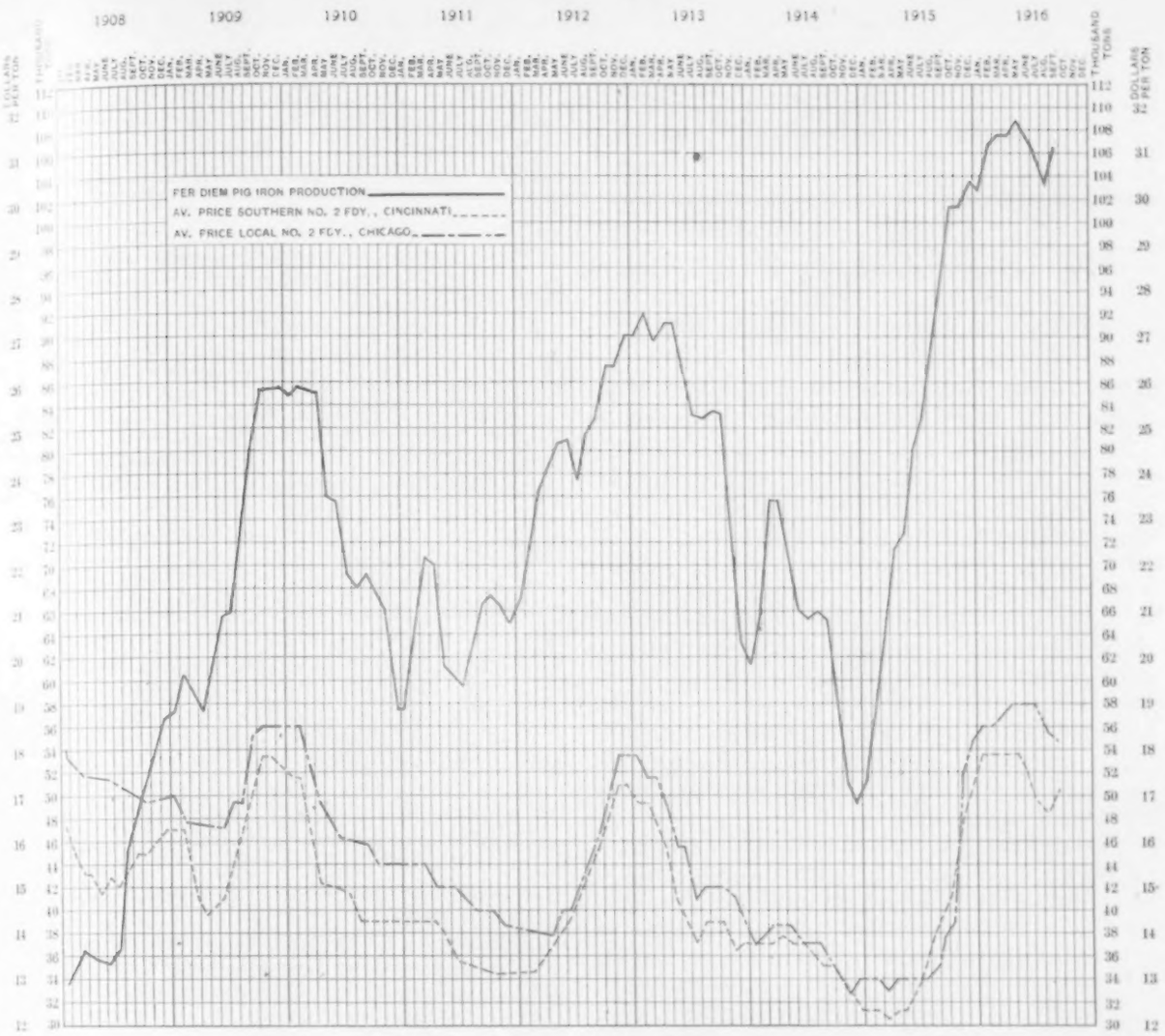


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from Jan. 1, 1908, to Oct. 1, 1916; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of THE IRON AGE.

Blast Furnace Notes

On Oct. 1 the Carnegie Steel Company was operating 57 out of its 59 blast furnaces. Edgar Thomson I, which had been out for relining and repairs, was blown in Sept. 2, and Lucy No. 2, also out for relining and repairs, was blown in Sept. 20. Bellaire No. 2, which has been completely rebuilt and enlarged, was blown in Sept. 20. At present the only idle furnaces are one Isabella, at Pittsburgh, which is being relined and repaired, and the small Zanesville, Ohio, stack, which may not be operated again.

Dover furnace, of M. A. Hanna & Co., Canal Dover, Ohio, will be blown out this week. This stack will be provided with a thin lining and larger hearth, increasing its rated capacity from 400 to 500 tons per day.

All five Eliza blast furnaces of the Jones & Laughlin Steel Company, Pittsburgh, are again in blast, the one stack that was idle for relining and repairs having resumed blast early in September.

No. 2 South Chicago stack of the Illinois Steel Company blew in Oct. 2.

All of the blast furnaces in the Mahoning and Shenango valleys were in blast on Oct. 1, Cherry Valley furnace having been blown in on Sept. 29.

The Donner Steel Company, Buffalo, has leased the entire property of the Tonawanda Iron & Steel Company at North Tonawanda, N. Y., for three years with an option of purchase. The plant includes the two Niagara furnaces which have been idle for approximately two years. It is expected that one of the furnaces will be put in blast shortly to manufacture ferromanganese.

The Bellaire furnace of the Carnegie Steel Company blew in Sept. 20, thus placing all the furnaces in the Wheeling district on the active list.

With the exception of the No. 2 Isabella furnace of the Carnegie Steel Company all the blast furnaces in the Pittsburgh district were active on Oct. 1.

Midvale Stockholders Get Good Report

Stockholders of the Midvale Steel & Ordnance Company held their first annual meeting Oct. 3. They were informed that earnings in excess of 30 per cent on the stock were coming in, exclusive of profits from a contract for 3,000,000 rifles for the British Government. This information was given in the following statement presented in behalf of President William E. Corey, who was absent on a Western trip:

> From the standpoint of our company, business conditions are entirely satisfactory. All of our plants are operating to full capacity and orders are being received in excess of shipments. Net earnings, leaving entirely out of consideration the manufacture of rifles by the Remington Arms Company under its contract with the British Government, since the acquisition of the Cambria Steel Company in February, are in excess of $2,500,000 per month. During the past year additions to our plants have been under construction and will be completed by Jan. 1, 1917, resulting in a total increased production of 1000 tons of pig iron and 1200 tons of open hearth steel per day.

Vice-President William B. Dickson presided at the meeting in Mr. Corey's absence. The stockholders elected these directors to serve for three years: Samuel M. Vauclain, A. C. Dinkey, W. P. Barba, Frederic W. Allen and John C. Neale.

Iron and Steel Markets

PIG IRON AGAIN HIGHER

All Grades Lifted by Export Sales

Increased Pig-Iron Production—Implement Makers Need More Steel—An Export Record

Heavy buying of pig iron, accompanied by price advances on top of those of last week, is the outstanding feature of the iron market. It comes while evidence is accumulating of the trend of finished steel to still higher prices. Export demand is partly responsible in iron, as it has been in steel, but, with high levels regarded as certain for months to come, domestic purchases, one after another, are, after repeated postponements, being brought forward. In the face of a shortage of labor for the increased business, the mills have difficulty in adding to production and shortening deliveries, yet buyers could use more material; the result is the growing price strength.

The greatest activity has occurred in Bessemer and basic pig iron, which have risen $1.25 per ton in two weeks. Low phosphorus iron has been conspicuous, some 60,000 tons, and perhaps as much as 100,000 tons, being taken for export at rapidly advancing prices. As high as $35 per ton was paid, and quotations are at present above this figure. The present movement in basic iron for export has taken close to 200,000 tons from one Alabama producer, and another Southern basic producing interest has refused additional offers after selling 100,000 tons. In Pittsburgh 70,000 tons were sold.

Foundry buying has also improved. In Chicago this has resulted in part through the adjustment of labor difficulties in that city and in Milwaukee. Foundry iron is 25c. and 50c. per ton higher, and likely to climb farther if more stacks are put on basic iron. Buffalo furnaces have taken 25,000 tons for the East, and in the last six weeks 400,000 tons have been booked in Birmingham. Detroit will shortly buy 30,430 tons of cast-iron pipe.

Pig-iron production has been bettered, as expected, responding in part to the more favorable weather conditions of September over those of August. Last month's total for the thirty days was 3,202,366 tons, or 106,745 tons a day, against 3,203,713 tons for August, or 103,346 tons a day. The month opens up well with 328 furnaces in blast, with a daily capacity of 106,578 tons, against 9 less furnaces, or 319, which started September, representing a daily producing rate of 104,502 tons.

An illuminating illustration of the diminishing check on buying caused by high-price levels is the quiet inquiry for steel bars being made by the implement manufacturers. It appears that consumers of their machinery are buying heavily, one interest, indeed, in Southern territory, ordering five times more than a year ago. Incidentally, what steel bars are available for relatively early delivery are now $3 per ton higher.

Structural steel is also stiffening. It is believed that as much fabricated work was contracted for in September as in April, or perhaps May of this year. The steel has been placed for the New York Central Hotel, New York, taking 15,000 tons, and for buildings at the Norfolk Navy Yard, requiring 4000 tons. An advance of $2 a ton for plain material on contracts already made by a number of mills is likely to be general in a few days.

About 2500 cars have been bought by the railroads but there is no let up in the demand for plates. Some 60,000 tons are involved in the 560 miles of 8-in. and 220 miles of 6-in. pipe for the Sinclair Oil & Refining Corporation for a line from Tulsa to Chicago. It was necessary to distribute this business among three mills. Some 11,000 tons have been bought for shipbuilding purposes at Staten Island and more is wanted. Japan has paid as high as 4½c. One leading mill has rejected an offer of 3½c., Pittsburgh, for practically its entire output of sheared plates for the last half of 1917.

The August exports of iron and steel broke the record. They totaled 598,192 tons against the high total of 540,000 tons in May. The figures bear out the contention that the smaller amounts for June and July did not mean that the high point of the export movement had been passed, and indeed the showing of the steel works' order books at the time was otherwise.

The signs are that tin-plate prices for next year will be higher, and box annealed sheets, though themselves not in unusual demand, are now quoted at 3.10c., Pittsburgh, as a minimum, due to the higher cost of semi-finished steel.

The inquiries for 35,000 tons of rails for France and for 22,000 tons for a road in western Canada are not yet satisfied, and not much has been placed against the 30,000 tons for a number of American railroads acceptable for 1918 delivery.

Coke is 25c. and 50c. higher per ton, due largely to labor shortages at the coke ovens, and the scrap market has also stiffened in line with the advances in pig iron.

Pittsburgh

PITTSBURGH, PA., Oct. 3, 1916.

The greatest activity the past week was in Bessemer and basic pig iron, both of which have been bought heavily, bringing much higher prices. Bessemer iron is up squarely to $22.50, with reports of sales at $23, Valley furnace, while basic has sold in large lots at $19.50. The tendency in prices on nearly all lines of semi-finished and finished material is toward higher values. The expected advance in prices on wire has not materialized, this probably being held back by reason of the serious illness of the general sales manager of the leading wire interest. Prices on billets and sheet bars are extremely firm, $45 being regarded as minimum, prices ranging from this figure up to $50 at mill. Sheets are also very firm, blue annealed having advanced $2 per ton. Coke and scrap have moved up sharply. The surprise of the market is coke, which has already sold on contracts for first half of next year at $3 per net ton at oven, while spot coke has sold at $3.25, with reports of sales at $3.50. A serious shortage in labor is holding down the output of coke and is also restricting the output in finishing mills, common labor being reported exceedingly scarce at all places where it is employed. There has been no general advance in prices

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous

For Early Delivery.

Pig Iron, Per Gross Ton:	Oct. 4, 1916.	Sept. 27, 1916.	Sept. 6, 1916.	Oct. 6, 1915.
No. 2 X, Philadelphia	**$19.75**	$19.50	$19.50	$16.25
No. 2, Valley furnace	**19.00**	18.50	18.25	14.75
No. 2, Southern, Cin'ti	17.40	17.40	16.90	14.40
No. 2, Birmingham, Ala.	14.50	14.50	14.00	11.50
No. 2, furnace, Chicago*	**18.50**	18.00	18.50	14.25
Basic, del'd eastern Pa.	**20.00**	19.75	19.75	17.00
Basic, Valley furnace	**19.50**	19.00	18.00	15.00
Bessemer, Pittsburgh	**23.45**	22.95	21.95	16.95
Malleable Bess., Ch'go*	19.00	19.00	19.00	15.00
Gray forge, Pittsburgh	**19.95**	19.20	18.70	14.70
L. S. charcoal, Chicago	19.75	19.75	19.75	15.75
Billets, etc., Per Gross Ton:				
Bess billets, Pittsburgh	45.00	45.00	45.00	24.50
O.-h. billets, Pittsburgh	45.00	45.00	45.00	25.00
O.-h. sheet bars, P'gh	45.00	45.00	45.00	25.50
Forging billets, base, P'gh	69.00	69.00	69.00	33.00
O.-h. billets, Phila	48.00	48.00	48.00	30.00
Wire rods, Pittsburgh	55.00	55.00	55.00	31.00
Finished Iron and Steel,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.47½	1.47½	1.47½	1.25
O.-h. rails, heavy, at mill	1.56½	1.56½	1.56½	1.34
Iron bars, Philadelphia	2.659	2.659	2.659	1.509
Iron bars, Pittsburgh	2.60	2.60	2.60	1.40
Iron bars, Chicago	2.35	2.35	2.35	1.35
Steel bars, Pittsburgh	**2.75**	2.60	2.60	1.40
Steel bars, New York	**2.919**	2.769	2.769	1.569
Tank plates, Pittsburgh	4.00	4.00	4.00	1.40
Tank plates, New York	4.169	4.169	4.169	1.569
Beams, etc., Pittsburgh	2.75	2.75	2.60	1.40
Beams, etc., New York	**2.869**	2.769	2.769	1.569
Skelp, grooved steel, P'gh	2.35	2.35	2.35	1.40
Skelp, sheared steel, P'gh	2.45	2.45	2.45	1.45
Steel hoops, Pittsburgh	3.00	3.00	3.00	1.40

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Oct. 4, 1916. Cents.	Sept. 27, 1916. Cents.	Sept. 6, 1916. Cents.	Oct. 6, 1915. Cents.
Sheets, black, No. 28, P'gh	**3.10**	3.00	2.90	2.00
Galv. sheets, No. 28, P'gh	4.25	4.25	4.15	3.50
Wire nails, Pittsburgh	2.60	2.60	2.60	1.75
Cut nails, Pittsburgh	2.60	2.60	2.60	1.70
Fence wire, base, P'gh	2.55	2.55	2.55	1.60
Barb wire, galv., P'gh	3.45	3.45	3.45	2.60
Old Material, Per Gross Ton:				
Iron rails, Chicago	19.25	19.25	18.75	13.50
Iron rails, Philadelphia	20.00	20.00	20.00	18.50
Carwheels, Chicago	11.75	11.75	11.50	12.00
Carwheels, Philadelphia	15.50	15.50	15.50	14.00
Heavy steel scrap, P'gh	**17.50**	16.50	16.00	14.00
Heavy steel scrap, Phila.	**15.00**	14.75	14.75	15.00
Heavy steel scrap, Ch'go	16.25	16.25	15.75	11.75
No. 1 cast, Pittsburgh	15.00	15.00	14.50	13.00
No. 1 cast, Philadelphia	16.00	16.00	16.00	14.00
No. 1 cast, Ch'go (net ton)	**12.50**	12.25	12.00	10.50
No. 1 RR. wrot, Phila	20.00	20.00	20.00	16.50
No. 1 RR. wrot, Ch'go (net)	**16.75**	16.50	16.00	11.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	**$3.25**	$3.00	$3.00	$1.75
Furnace coke, future	**3.00**	2.85	2.50	2.25
Foundry coke, prompt	3.25	3.25	3.50	2.15
Foundry coke, future	**3.75**	3.50	3.50	2.50
Metals,				
Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	**28.25**	28.00	28.00	18.00
Electrolytic copper, N. Y.	*28.50*	28.75	28.00	18.00
Spelter, St. Louis	**9.50**	8.75	8.50	14.00
Spelter, New York	**9.70**	9.00	8.75	14.25
Lead, St. Louis	6.85	6.85	6.60	4.42½
Lead, New York	**7.05**	7.00	6.75	4.50
Tin, New York	**39.25**	38.62½	38.87½	32.00
Antimony, Asiatic, N. Y.	*10.00*	11.00	12.00	28.00
Tin plate, 100-lb. box, P'gh	$5.75	$5.75	$5.75	$3.15

on bars and shapes; while some mills are quoting 2.70c. flat on both bars and shapes, 2.60c. is still being done to regular customers for delivery at convenience of the mill. The whole market is as strong as it could possibly be, with the outlook indicating higher prices all along the line. Consumers are showing more willingness to cover for the first half of the year, and are now paying prices for that delivery which they refused even to consider a month or more ago.

Pig Iron.—W. P. Snyder & Co. report the average price on basic iron in September to have been $18.63, and on Bessemer, $21.93, Valley furnace, an advance over August in basic of 63c. and in Bessemer of 93c. Sales reported were 70,000 tons of basic and 65,000 tons of Bessemer. There have been heavy sales of both Bessemer and basic in the past week and at the highest prices yet reached on this movement. There is every indication that they will go still higher, and $25 for Bessemer and at least $22 for basic are predicted before the first of the year. A large amount of both Bessemer and basic is under negotiation at this writing with chances favoring the closing of some large sales before the week is out. The demand for foundry iron is also quite active and prices on No. 2 have advanced squarely to $19 at Valley furnace, with some sellers asking $19.50. We note sales of 10,000 tons and 5000 tons of basic at $19.50 and 5000 tons of Bessemer, also 2000 tons and 28,000 tons on a sliding scale contract, all at $22.50, Valley furnace. Sales are also reported of 2000 tons and 30,000 tons of Bessemer at $23, Valley furnace. A leading radiator interest is reported to have closed for about 10,000 tons of foundry iron for delivery over the first half of the year, and an Ohio River steel company is reported to have taken 15,000 tons of basic for first half of next year, but none of this iron is to go from Valley furnaces. A local consumer, that had an option on 10,000 tons of Bessemer iron that expired early last week, closed this at a price considerably under the price ruling today. We quote standard Bessemer iron, $22.50; basic, $19.50; No. 2 foundry, $19 to $19.50; malleable Bessemer, $19.50 to $19.75; gray forge, $19, all at Valley furnace, the freight rate for delivery to the Pittsburgh and Cleveland districts being 95c. per ton.

Billets and Sheet Bars.—While the new demand for billets and sheet bars is only fairly active, most consumers being covered by regular contracts, the market is very firm and $45 at mill is minimum price on either Bessemer or open-hearth billets and sheet bars, with some sellers asking up to $50. The foreign inquiry for steel has quieted down, but it is said several of the larger mills are very short of steel and are picking up considerable quantities of small ingots from steel casting plants and other sources, for which they are paying $45 and higher. We quote soft Bessemer and open-hearth steel billets and sheet bars at $45 to $50 at mill, Youngstown or Pittsburgh. We quote forging billets at $69 for sizes up to but not including 10 x 10 in., and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 extra.

Ferroalloys.—The new inquiry for ferromanganese is not heavy, consumers evidently believing that prices may be lower. An inquiry is in the market from a large steel company for 1200 tons—200 tons a month for the first half of 1917—which may be closed this week. It is reliably stated that two makers of domestic ferromanganese are offering it at $160 at furnace, or $4 per ton under what is regarded as the official price for English 80 per cent. We quote foreign and domestic 80 per cent ferromanganese at $160 to $164, seaboard. We quote 18 to 22 per cent spiegeleisen at $40 to $45, and 25 to 30 per cent $55 to $65, at furnace. On 50 per cent ferrosilicon we quote $88 to $89 in lots up to 100 tons; over 100 tons, $87 to $88, and over 600 tons, $86 to $87, all per gross ton, f.o.b. Pittsburgh. We quote Bessemer ferrosilicon as follows: 9 per cent, $30; 10 per cent, $31; 11 per cent, $32; 12 per cent, $33; 13 per cent, $34.50; 14 per cent, $36.50; 15 per cent, $38.50, and 16 per cent, $41. Seven per cent silvery is $28.50; 8 per cent, $29; 9 per cent, $29.50; 10 per cent, $30; 11 per cent, $31, and 12 per

cent, $32. These prices are f.o.b. furnace, Jackson or New Straitsville, Ohio, or Ashland, Ky., all having a freight rate of $2 per gross ton to Pittsburgh.

Steel Rails.—Inquiries are in the market for considerable quantities of standard section rails from railroads that have already contracted for 1917, but find they will need more than called for in their contracts. The Pennsylvania lines west is said to have closed for 5000 tons, and even larger contracts are also said to have been closed. None of the rail mills is promising deliveries before the second half of 1917, while the Carnegie Steel Company will not quote for delivery before the last quarter of that year. The new demand for light rails is fairly active from the coal-mining concerns, but from the traction and lumber interests is quiet. We quote 25 to 45 lb. sections at $47; 16 and 20 lb., $48; 12 and 14 lb., $49, and 8 and 10 lb., $50, in carload lots, f.o.b. at mill, the usual extras being charged for less than carload lots. We quote standard section rails of Bessemer stock at $33 and of open-hearth $35, per gross ton, Pittsburgh.

Plates.—Orders for steel cars are coming out more freely, and inquiry is heavier than for some time. The Chesapeake & Ohio has ordered 1000 70-ton hopper cars from the Pressed Steel Car Company, and the National Refining Company has ordered 60 40-ton tank cars, and the Illinois Traction Company 60 steel hoppers and 40 steel gondolas from the American Car & Foundry Company. The Wheeling & Lake Erie is in the market for 1500 70-ton steel gondolas and 500 70-ton steel hopper cars. The Western Maryland is in the market, and will likely close this week for 2000 steel hoppers. The Carnegie Steel Company is low bidder on about 20,000 tons of ship plates for two Government colliers. The steel plates for the first lot of ships in the new naval program amount to about 200,000 tons, and bids will be opened on these about Oct. 20. The situation in plates is getting tighter and the absolute minimum mill price on sheared plates is 3.50c. for such deliveries as the mills can make. One leading mill has been offered 3.50c. for practically its entire output of sheared plates for the last half of 1917, and turned the order down, desiring to take care of its regular customers. The mill price on ¼-in. and heavier plates we quote at 3.50c. for delivery in the second half of 1917, while for delivery in two to four months prices now range from 4c. to 4.50c. at mill. Small lots of sheared plates for fairly prompt shipment are reported to have sold as high as 5c. at mill.

Structural Material.—While there has been no general advance on plain material to 2.70c., as reported, local mills are naming 2.70c. in most cases, but are still quoting 2.60c. to some customers for such deliveries as they can make. Inquiry is active in spite of the very high prices. The McClintic-Marshall Company has taken 1500 tons for new steel buildings for the Whitney Glass Company, Glassboro, N. J., and the Jones & Laughlin Steel Company 3500 tons for the Paternal Apartment House substructure at the Grand Central Terminal in New York City. The Philadelphia & Reading has divided 300 tons of bridge work between the Phoenix Bridge Company and McClintic-Marshall Company. The Baltimore & Ohio, the Boston & Maine and the Maine Central are all preparing specifications for bridge work, which are expected to come to the shops for bids within the next 60 days. We now quote beams and channels up to 15 in. at 2.60c. to 2.70c. at mill for such deliveries as the mills can make, which probably would not be before second or third quarters of next year, and small lots from stock for fairly prompt shipment readily bring 3c. to 3.25c., Pittsburgh.

Sheets.—There is continued activity in the new demand for Bessemer black, blue annealed and galvanized sheets, prices being very firm and showing indications of going higher. The leading interest has advanced its prices on black and galvanized sheets $3 per ton and other makers on blue annealed sheets $2 per ton. The export demand for Bessemer black and galvanized sheets is heavy. It is claimed that none of the mills is selling sheets for delivery into next year, but will likely open books for such contracts in a short time. We quote Nos. 9 and 10 blue annealed sheets at 3c. to 3.10c.; No. 28 Bessemer black, 3.10c., and open-hearth, 3.15c.; No. 28 Bessemer galvanized, 4.25c., and open-hearth, 4.40c. Nos. 22 and 24 black plate, tin-mill sizes, H. R. & A., 2.90c.; Nos. 25, 26 and 27, 3c. to 3.10c.; No. 28, 3.10c. to 3.15c., and No. 29, 3.20c. to 3.25c. These prices are for carloads and larger lots, f.o.b. mill, Pittsburgh.

Tin Plate.—It is expected that about Oct. 15 the leading interest will announce its price on tin plate for 1917 delivery. Heretofore the general belief has been that this price would not be higher than $5.50 per base box, and, in fact, it is said that one leading interest favored strongly putting the price at $5. Developments the past week or two have changed the aspect in the tin-plate trade, and it is now said the price for 1917 delivery will possibly be as high as $6 per base box. One reason for this is the mills will carry on an average into next year close to three months' production of tin plate for which they will obtain not over $3.50 per base box. This is a decided advantage to consumers. It is a well-known fact that profits of tin-plate mills for 1916, when the year is figured up, will be very small in comparison with what they should have been when general conditions in the steel trade over all of this year are considered. There is an insistent heavy demand, and it is claimed that $5.50 for wasters and $6 for production tin plate can readily be obtained for delivery this year.

Rivets.—The new demand is stated to be fairly active, but not so heavy as some time ago, most consumers being covered over the remainder of this year and some into the first quarter of next year. There is also a heavy foreign demand, mostly from India, China, Japan and South America. There is still some unevenness in prices among jobbers, who have stocks of rivets bought when prices were lower than they are now. Makers' quotations are as follows: Buttonhead structural rivets, ½ in. in diameter and larger, $4 per 100 lb., base, and conehead boiler rivets, same sizes, $4.10 per 100 lb., base, f.o.b. Pittsburgh. Terms are 30 days net, or one-half of 1 per cent for cash in 10 days.

Railroad Spikes and Track Bolts.—Makers report the demand for spikes better than for some time, two local makers receiving heavy specifications in the past week against contracts placed early this year. The fact is emphasized that spikes at 2.65c. are relatively low, and an advance in the near future is anticipated. The new demand for track bolts is also more active, evidently due to the fact that the railroads are anxious to get as much work finished as possible before bad weather comes. We quote track bolts with square nuts at 4.50c. to 4.75c. to railroads and 5c. to 5.25c. in small lots to jobbers, base. Track bolts with hexagon nuts take the usual advance of 15c. per 100 lb. Prices on spikes are as follows:

Standard railroad spikes, 4½ x 9/16 in. and larger, $2.65 to $2.75; railroad spikes, ½ and 7/16 in., $2.75 base; railroad spikes, ⅜ in. and 5/16 in., $3.05 base; boat spikes, $2.80 base, all per 100 lb. f.o.b. Pittsburgh.

Cold-Rolled Strip Steel.—It is expected that about next week some makers will open their books for orders for the first quarter and first half of 1917. It is believed that prices for such deliveries will be on the present basis of $6 per 100 lb. Nearly all consumers are covered over the remainder of this year and there is very little new buying. We quote cold-rolled strip steel at $6, base, on contracts for delivery over the remainder of the year, and $6.50 to $6.75 in small lots for fairly prompt shipment. Terms are 30 days net, less 2 per cent off for cash in 10 days, delivered in quantities of 300 lb. or more when specified for at one time.

Wire Rods.—There is a very active demand, greater than the mills can supply promptly. There is also some heavy export inquiry. Two local makers are not quoting on export rods, stating they need their entire supply for their own wire mills and for domestic customers. Prices are very firm. We quote soft Bessemer, open-hearth and chain rods at $55 to $60 per ton, f.o.b. Pittsburgh.

Nuts and Bolts.—Makers report the new demand only fairly active, as nearly all consumers are covered over the remainder of this year and some into the first quarter and first half of 1917. Deliveries of steel bars by the mills to the factories are very unsatisfactory

and are restricting the output of nuts and bolts materially. Prices are firm. Discounts are as follows, delivered in lots of 300 lb. or more, where the actual freight rate does not exceed 20c. per 100 lb., terms 30 days net, or 1 per cent for cash in 10 days:

Carriage bolts, small, rolled thread, 50 and 5 per cent; small, cut thread, 40, 10 and 5 per cent; large, 35 and 5 per cent.

Machine bolts, h. p. nuts, small, rolled thread, 50 and 10 per cent; small, cut thread, 50 per cent; large, 40 and 5 per cent.

Machine bolts, c. p. c. and t. nuts, small, 40 and 10 per cent; large, 35 per cent. Blank bolts, 40 and 5 per cent. Bolt ends, h. p. nuts, 40 and 5 per cent; with c. p. nuts, 35 per cent. Rough stud bolts, 15 per cent. Lag screws (cone or gimlet point), 50 and 5 per cent.

Forged set screws and tap bolts, 10 per cent. Cup and round point set screws, case-hardened, 60 per cent. Square or hexagon head cap screws, 55 per cent. Flat, button, round or fillister head cap screws, 30 per cent.

Nuts, h. p. sq., tapped or blank, $2.70 off list; hex., $2.70 off. Nuts, c. p. c. and t. sq., tapped or blank, $2.40 off; hex., $2.80 off. Semi-finished hex. nuts, 60 and 5 per cent. Finished and case-hardened nuts, 60 and 5 per cent.

Rivets, 7/16 in. in diameter and smaller, 45, 10 and 5 per cent.

Iron and Steel Bars.—While the minimum mill prices on steel bars remain at 2.60c., Pittsburgh, for such deliveries as the mills can make, it is likely this price will shortly be advanced to 2.70c., or possibly 2.75c. On some recent quotations sent out by two local mills in which shapes were involved, a flat price of 2.70c. was quoted on both the shapes and bars, but there are still quotations going out on steel bars at 2.60c. The demand is reported urgent and the two leading local makers are understood to have their output well sold up through the first half of 1917. Some large orders for steel bars have been placed lately by carbuilders, and it is said that none of these orders went at less than 2.50c. at mill. Foreign inquiry for steel rounds has quieted down, but very large quantities of these are still being made at various plants in this city and also at Youngstown. One mill of the Carnegie Steel Company at Bessemer, Pa., has been operating on steel rounds for some months. The demand for iron bars is active and mills report they are sold up for three or four months ahead. We quote steel bars at 2.60c. to 2.70c. at mill for delivery in the first quarter and first half of 1917, while for prompt shipment from warehouse up to 3.25c. is quoted. We quote refined iron bars at 2.75c. to 2.85c., and railroad test bars at 2.85c. to 2.90c., f.o.b. Pittsburgh.

Wire Products.—The expected advance in wire and wire nails has not yet been made, but it may come at any time. Makers report the demand for wire nails as very heavy, and practically the entire output of mills in this district is under contract for the remainder of this year. There is also an insistent demand for wire nails for South America, England, France and other countries, but on many of these inquiries local mills are not quoting, as they cannot make deliveries. Specifications against contracts are very heavy, and it is not believed the supply of barb wire and wire nails will be large enough to meet the demand this fall. Prices to the large trade in effect at this writing are as follows: Wire nails, $2.60, base, per keg; galvanized, 1 in. and longer, including large head barbed roofing nails, taking an advance over this price of $2, and shorter than 1 in., $2.50. Bright basic wire is $2.65 per 100 lb.; annealed fence wire, Nos. 6 to 9, $2.55; galvanized wire, $3.25; galvanized barb wire and fence staples, $3.45; painted barb wire, $2.75; polished fence staples, $2.75; cement-coated nails, $2.50, base, these prices being subject to the usual advances for the smaller trade, all f.o.b. Pittsburgh, freight added to point of delivery, terms 60 days net, less 2 per cent off for cash in 10 days. Discounts on woven wire fencing remain at 60 per cent off list for carload lots, 59 per cent for 1000-rod lots, and 58 per cent for small lots, f.o.b. Pittsburgh.

Shafting.—Several makers are now entering contracts for cold-rolled and cold-drawn shafting for delivery in the first quarter and first half of 1917 at 20 per cent and 15 per cent off list, the most desirable contracts going at the greater discount. Makers have their output sold up for the remainder of this year, and on small current orders for delivery in the next two or three months 10 per cent off list is quoted and occasionally the list price. It is expected that some large contracts will be made this month for delivery through the first half of 1917. We quote cold-rolled shafting at 20 to 15 per cent off in carload lots for delivery in last quarter of this year and first quarter of 1917, and 10 per cent off in less than carload lots, f.o.b. Pittsburgh, freight added to point of delivery.

Merchant Steel.—The new demand is heavy. Large consumers are now trying to cover on their needs for the first quarter and first half of next year. The mills are quoting considerably higher prices for these deliveries than are ruling now, and in some cases consumers are holding up placing contracts. For small lots, prices are as follows: Iron-finished tire, ½ x 1½ in. and larger, 2.60c., base; under ½ x 1½ in., 2.75c.; planished tire, 2.75c.; smooth channel tire, ¾ to ⅞ and 1 in., 2.85c. to 2.90c.; 1⅛ in. and larger, 3.10c.; toe calk, 3.10c. to 3.15c., base; flat sleigh shoe, 2.75c.; concave and convex, 2.85c.; cutter shoes, tapered or bent, 3.25c. to 3.35c.; spring steel, 3.25c. to 3.50c.; machinery steel, smooth finished, 2.90c. to 3c., all f.o.b. at mill.

Hoops and Bands.—Mills report the new demand for both hoops and bands as very active and specifications against contracts are heavy. Several leading makers have not as yet opened their books for the sale of either hoops or bands for next year's delivery, but will probably do so this month. Steel hoops remain firm at 3c. and bands at 2.60c., with extras on the latter as per the steel bar card, but it is expected that prices on bands will be higher in the near future.

Wrought Pipe.—The Sinclair Oil & Refining Corporation has contracted for 560 miles of 8-in. and 220 miles of 6-in. line pipe for the laying of an oil line from the Tulsa fields in Oklahoma to Chicago. Spang, Chalfant & Co. will furnish 300 miles of 8 in.; National Tube Company, 260 miles of 8 in.; Wheeling Steel & Iron Company, all the 6 in. The line is to be laid this year, and will take 60,000 tons of plates. The new demand for pipe is heavy. Mills are sold up on lap-weld sizes for five or six months, but on butt-weld sizes can make fairly prompt shipments. Discounts on iron and steel pipe, which are very firm, are given on another page.

Boiler Tubes.—Makers report the demand for locomotive and merchant tubes as very heavy and state their output is practically sold up through the first half of 1917. On seamless steel tubing the two leading makers state they have obligations on the books that practically take their entire output well up to the close of 1917. Prices are very firm, another advance in both iron and steel tubes being looked for in the near future. Discounts are printed on another page.

Coke—Heavy inquiries are in the market for furnace coke for first half and for all of 1917 delivery, but so far as known only one contract has been closed, this being about 10,000 tons per month to go to Alice furnace at Sharpsville, Pa., at $3 per net ton at oven. A Buffalo steel company has an inquiry out for 14,000 tons of furnace coke per month for January-March, and 30,000 tons per month April-December inclusive. The Andrews & Hitchcock Iron Company, owned by the Youngstown Sheet & Tube Company, is inquiring for 24,000 tons per month for the entire year. An eastern Pennsylvania company is asking prices on 8000 tons per month for the first six months of next year. The Midvale Steel Company has tentative inquiries out for about 90,000 tons of coke per month over all next year, of which 35,000 tons are for the Worth furnaces at Coatesville, and 55,000 tons for furnaces of the Cambria Steel Company at Johnstown. This amount of coke will also take care of the third Worth stack being built, which is expected to be ready for operation about February or March. Prices on blast-furnace coke are firmer. One seller is now asking $3.50 per net ton on contracts for first half of 1917. There is a fair demand for prompt furnace coke. We quote best grades of prompt furnace coke at $3.25 to $3.50, and on contracts for first half of next year at $3 per net ton at oven. Best grades of 72-hr. foundry coke are held at $3.25 to $3.50 for prompt shipment, and $3.75

to $4 on contracts. The Connellsville *Courier* gives the output of coke in the upper and lower Connellsville regions for the week ended Sept. 23 as 404,600 net tons, an increase over the previous week of 11,153 tons.

Old Material—The tone of the scrap market is much stronger, due largely to the heavy advances on Bessemer and basic iron. Scrap prices on nearly all grades are higher, with indications favoring further advances. New buying as yet is not heavy, but dealers have changed their views considerably on prices, and are refusing offers that they would have been glad to accept a week or two ago. Sales are reported of several large lots of heavy steel scrap at $17 and higher, and some dealers are now quoting $18 per gross ton. The demand is mostly for heavy steel melting scrap, low phosphorus melting stock and borings. It is claimed the amount of available steel melting scrap is limited. Prices now being quoted by dealers for delivery in Pittsburgh and points that take the same rates of freight, per gross ton, are as follows:

Heavy steel melting scrap, Steubenville, Follansbee, Breckenridge, Sharon, Monessen, Midland and Pittsburgh, delivered	$17.50 to $18.50
No. 1 foundry cast	15.00 to 15.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	18.00 to 18.50
Hydraulic compressed sheet scrap	13.50 to 14.00
Bundled sheet scrap, sides and ends, f.o.b. consumers' mills, Pittsburgh district	11.00 to 11.25
Bundled sheet stamping scrap	10.50 to 10.75
No. 1 railroad malleable stock	15.00 to 15.25
Railroad grate bars	11.00 to 11.25
Low phosphorus melting stock	20.50 to 21.00
Iron car axles	34.00 to 35.00
Steel car axles	35.00 to 36.00
Locomotive axles, steel	38.00 to 39.00
No. 1 busheling scrap	13.50 to 13.75
Machine-shop turnings	7.50 to 7.75
Old carwheels	14.00 to 14.25
Cast-iron borings	8.50 to 9.00
*Sheet bar crop ends	18.50 to 19.00
No. 1 railroad wrought scrap	18.50 to 18.75
Heavy steel axle turnings	10.00 to 10.25
Heavy breakable cast scrap	12.50 to 12.75

*Shipping point.

Chicago

CHICAGO, ILL., Oct. 3, 1916.

A significant and important change of front has been revealed within the past fortnight in the new attitude taken by the implement interests in the matter of the sales of their product. It is now stated by leading manufacturers of farm machinery that the farmer buyer has accepted the condition of higher prices and purchases are exceeding every expectation. It is reported that orders received by one large interest from Southern territory are five times greater than those of a year ago. The long cherished axiom that high prices militate especially against buying by the farm trade now seems less formidable. A feature of the market is the quiet inquiry of implement manufacturers regarding both mild and rail carbon bars and bolts and nuts. They are also making substantial purchases of pig iron. Rail inquiry now under consideration includes 22,000 tons for Canada and the 20,000 tons for France. There is an increased interest in structural steel. Car purchases last week totaled 2500, of which the most important was the Missouri Pacific order for 1500, placed with the Western Steel Car & Foundry Company. An advance of $2 a ton has been made in the price of plain material. The tremendous demand for plates, particularly those suitable for shipbuilding, and also lighter gages in widths varying from 60 in. to 72 in., largely for export, shows no abatement. The high mark thus far appears to have been reached in connection with plates for Japan, placed at 4.50c., but sales of light gage narrow plates at 3.75c. are also noted. Higher prices for box annealed sheets are announced and 3c., Pittsburgh, is now a minimum for local mills. Continued heavy selling of pig iron has not yet brought any quotable advance in the prices of standard grades of Northern iron but iron from the South is now generally held at $15, Birmingham, with $14.50 the exception. A freer selling of steel scrap and foundry scrap is noted.

Pig Iron.—Buying of pig iron continues on a large scale with sales of malleable noticeably increased. While the larger part of the purchases are for first half delivery, there is also some buying for fourth quarter. From the producer's standpoint, the fourth quarter or prompt shipment period must still be the unsatisfactory phase of the situation, for upon it falls the consequences of reduced consumption and delayed shipments occasioned by the labor shortages and troubles of the year. A noticeable improvement in the Chicago and Milwaukee districts in the matter of labor, however, is reported as having made itself felt in the last thirty days. Purchases of malleable iron were much heavier last week and some sellers have advanced their price to $19.50, but $19 continues to be the price at which business is done. The effect of the heavy selling of iron upon prices is more noticeable in the South, where the principal producers are now uniformly quoting $15 for first half delivery. For fourth quarter, $14.50 can be done, and a number of sales of high silicon iron, considered to be of special analysis, have been made by one producer on the basis of $14.50, Birmingham, for prompt shipment. For Lake Superior charcoal iron we quote delivery prices at Chicago to include a freight rate of $1.75. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	$19.75
Lake Superior charcoal, No. 1	20.25
Lake Superior charcoal, No. 6 and Scotch	20.75
Northern coke foundry, No. 1	$19.00 to 19.50
Northern coke foundry, No. 2	18.50 to 19.00
Northern coke foundry, No. 3	18.00 to 18.50
Southern coke, No. 1 f'dry and 1 soft	19.00 to 19.50
Southern coke, No. 2 f'dry and 2 soft	18.50 to 19.00
Malleable Bessemer	19.00
Basic	19.00
Low phosphorus	34.00
Silvery, 8 per cent	29.50
Bessemer ferrosilicon, 10 per cent	33.50

Rails and Track Supplies.—Quotations on the inquiry covering 20,000 tons of rails for France are still outstanding, as is the case also in respect of the 22,000 tons for which the Pacific & Great Eastern Railroad of British Columbia has been in the market. Inquiry for rails for 1918 delivery has not amounted to so much in the West as it seems to have in Eastern markets, an aggregate of 30,000 tons representing all the inquiry that has been received. Quotations are as follows: Standard railroad spikes, 2.75c., base; track bolts with square nuts, 3.25c. to 3.50c., base, all in carload lots, Chicago; tie-plates, $50, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, $33, base; open-hearth, $35; light rails, 25 to 45 lb., $40; 16 to 20 lb., $41; 12 lb., $42; 8 lb., $43; angle bars, 2c., Chicago.

Structural Material.—Orders for 2500 cars were placed last week. this number including 1500 for the Missouri Pacific, 500 for the Nickel Plate, 300 for the Milwaukee Coke & Gas Company and 200 for the Chicago & Alton. Several small lots in addition were closed. As all of this business was protected in the matter of raw material, about 20,000 tons of steel has been added to the mill books. Inquiry for structural shapes has increased and buying is somewhat heavier. While it cannot be said that new business is impossible of being placed for delivery in the first half, yet the mills, generally speaking, have sold up their estimated capacity for that period, and further sales will continue to crowd tonnage over into the second half. If structural mills were being operated only on structural shapes, capacity adequate to the demand would doubtless be easily available. Contracts for fabricated material reported last week were not large with the exception of one for 1000 tons, taken by the Llewellyn Iron Works, covering the material for the Blackstone building at Los Angeles. The Utah Copper Company placed 360 tons for a new leaching plant. The Illinois Steel Company has followed the lead of the Carnegie Steel Company and advanced its quotation on structural steel to the basis of 2.70c., Pittsburgh. We therefore quote for Chicago delivery of structural steel from mill 2.889c.

We quote for Chicago delivery of structural steel out of jobbers' stock 3.25c.

Plates.—A sale of 2000 tons of plates for shipbuilding is noted for delivery in the first quarter at a

price of 4c., Pittsburgh, the interesting circumstance being that a portion of the plates will be less than 84 in. in width. On a recent sale to Japan, 4.50c., f.o.b. mill, was done. Another mill rolling plates in widths not to exceed 84 in. has been selling the lighter gages, from 3/16 in. to No. 16, at prices ranging from 3.65c. to 3.75c., for first quarter delivery. The demand for plates for shipbuilding and, in the lighter gages, for general manufacturing purposes apparently is without limit. It is to be noted that the mills which are quoting 3.50c. to 4c. on many inquiries are still taking contracts from regular customers, also for delivery in the first half, on the basis of 3c., Pittsburgh. We quote for Chicago delivery of plates from mill, at its convenience, 3.189c. For prompt shipment we quote 3.439c. to 3.689c. in widths up to 72 in., and for wide plates 4.189c.

We quote for Chicago delivery of plates from jobbers' stocks, 3.75c.

Sheets.—Makers of sheets have assumed a decidedly stiffer attitude in the matter of prices and the principal sellers are now quoting on one-pass box annealed a minimum of 3c. to 3.10c., Pittsburgh. This strength is due to the higher costs of semi-finished steel rather than to the demand for sheets except in the heavier gages. For light sheets, both black and galvanized, the demand has not greatly increased. The export demand for black sheets, No. 10 to No. 16 gage, is especially heavy and insistent. We quote for Chicago delivery, blue annealed, No. 16 and heavier, 3.439c.; box annealed, No. 17 and lighter, 3.189c. to 3.289c.; No. 28 galvanized, 4.439c.

We quote for Chicago delivery of sheets out of stock, minimum prices applying on bundles of 25 or more, as follows: No. 10 blue annealed, 3.40c.; No. 28 black, 3.25c.; No. 28 galvanized, 4.65c. to 4.75c.

Bars.—Implement manufacturers have at last given up the stress they have consistently laid upon inability to market their product at higher prices and are now seeking additional material to meet unexpected demands upon them. Endeavor has been made to increase the tonnages provided for under the contracts for mild steel bars placed at 2.50c., and particularly is inquiry being quietly made concerning the covering of their rail-carbon steel requirements. The market for iron bars is unchanged and, in fact, 2.35c., Chicago, has been clearly established as the price for first half contracts. A little business has been taken at 2.40c., but this is not general. We quote mill shipment, Chicago, as follows: Bar iron, 2.35c.; soft steel bars, 2.789c.; hard steel bars, 2.50c.; shafting, in carloads, 20 per cent off; less than carloads, 15 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 3.25c.; bar iron, 3.25c.; reinforcing bars, 3.25c. base with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting net list.

Rivets and Bolts.—The important inquiry now coming in to manufacturers of bolts and nuts is from the implement interests which have long delayed covering for their first half needs. Several inquiries, each of which exceeds a million bolts, are reported as having been quietly made. The rivet situation is without feature. We quote as follows: Carriage bolts up to ⅝ x 6 in., rolled thread, 50-5; cut thread, 40-10-2½; larger sizes, 35-2½; machine bolts up to ⅝ x 4 in., rolled thread, with hot pressed square nuts, 50-10; cut thread, 50; large size, 40-5; gimlet-point coach screws, 50-5; hot pressed nuts, square, $2.70 off per 100 lb.; hexagon, $2.70 off. Structural rivets, ¾ to 1¼ in., 4c. to 4.15c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

We quote out of store: Structural rivets, 4c.; boiler rivets, 4.10c.; machine bolts up to ⅝ x 4 in., 50-10; larger sizes, 40-10; carriage bolts up to ⅝ x 6 in., 50-5; larger sizes, 40-5; hot pressed nuts, square, $3.25, and hexagon, $3.25 off per 100 lb.; lag screws 55.

Wire Products.—Adverse delivery conditions appear ineffective in halting the demand for wire nails, particularly 8d. common and 16d. common. This inquiry is particularly insistent in that it is supported by actual consumer demand. There is also a sustained business in barb wire and some improvement in sales of fencing. We quote as follows per 100 lb.: Plain wire, Nos. 6 to 9, base, $2.839; wire nails, $2.789; painted barb wire, $2.939; galvanized barb wire, $3.639; polished staples, $2.939; galvanized staples, $3.639; all Chicago.

Cast-Iron Pipe.—Public lettings of pipe last week involved only small quantities, including 150 tons each at Chisholm, Minn., and Gilbert, Minn. At Detroit an inquiry for 500 tons is still open. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $34.50; 6 in. and larger, $31.50, with $1 extra for Class A water pipe and gas pipe.

Old Material.—The spectacular prices being paid by the dealers for old car axles, both iron and steel, are still a feature of the market, though they have little bearing upon domestic consumption. A somewhat freer buying of steel scrap is noted. There is also more activity in the buying of foundry grades, the International Harvester Company being in the market for stove plate and No. 1 cast. Sales of locomotive tires at prices as high as $23 are also noted. The general market continues to reflect an upward tendency in prices predicated upon the firm expectation of a considerable buying movement in the near future. Offerings of railroad scrap last week included a large list from the Pennsylvania Lines, 4300 tons from the Chicago & Northwestern, a like amount from the Santa Fé and 700 tons from the Chicago Great Western. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton	
Old iron rails	$19.25 to	$19.75
Relaying rails	19.50 to	20.50
Old carwheels	11.75 to	12.25
Old steel rails, rerolling	17.75 to	18.25
Old steel rails, less than 3 ft.	18.25 to	18.50
Heavy melting steel scrap	16.25 to	16.75
Frogs, switches and guards, cut apart	16.25 to	16.75
Shoveling steel	15.50 to	16.00
Steel axle turnings	8.75 to	9.25
	Per Net Ton	
Iron angles and splice bars	$18.75 to	$19.00
Iron arch bars and transoms	20.50 to	21.00
Steel angle bars	15.25 to	15.75
Iron car axles	30.00 to	30.50
Steel car axles	32.50 to	33.50
No. 1 railroad wrought	16.75 to	17.00
No. 2 railroad wrought	16.00 to	16.50
Cut forge	16.00 to	16.50
Pipes and flues	12.25 to	12.75
No. 1 busheling	14.25 to	14.75
No. 2 busheling	9.75 to	10.25
Steel knuckles and couplers	14.75 to	15.00
Steel springs	15.25 to	15.50
No. 1 boilers, cut to sheets and rings	10.25 to	10.75
Boiler punchings	14.00 to	14.50
Locomotive tires, smooth	22.75 to	23.25
Machine-shop turnings	5.50 to	6.00
Cast borings	6.50 to	7.00
No. 1 cast scrap	12.50 to	12.75
Stove plate and light cast scrap	9.75 to	10.25
Grate bars	10.00 to	10.25
Brake shoes	9.75 to	10.25
Railroad malleable	11.50 to	12.00
Agricultural malleable	11.00 to	11.50

Philadelphia

PHILADELPHIA, PA., Oct. 3, 1916.

Activity in the pig-iron market has been led by a tremendous movement in low phosphorus, both standard and copper-bearing. It is estimated that at least 50,000 tons has been placed under contract for export in the past few days, while domestic consumers have been large buyers for first half delivery and in some cases the entire year. Foundry grades are moving more freely also. All grades of pig iron now show advances or a decided stiffening in price. The pressure for steel products is increasing, and a new buying movement is under way, if that can be possible at a time when demand is so general. Deliveries of coke are slow, and prices are stronger. The embargoes against the Coatesville plate mills have been raised and a tide of old material will start to flow in that direction.

Pig Iron.—All grades are active and stronger, with low phosphorus in extremely heavy demand. It is estimated that about 50,000 tons has been taken in the past few days for export, at least 21,000 tons of which was copper-bearing iron. Domestic consumers have taken large quantities also, and it is predicted that the price will go to $40, delivered. Lebanon low phosphorus has sold for export recently at $30 to $31, furnace, while makers of standard are asking $36 to $37, delivered. Of the latter probably 20,000 tons has been taken in the past week. Most of the transactions call for deliveries over the first half of 1917, although in some instances

they are to run over the entire year. In basic, not much has been done since the recent large buying by the Lukens Iron & Steel Company, but quotations are stronger at $20 to $20.50, delivered. Foundry iron is moving much more freely, and some makers, principally those who are comfortably sold up, have advanced their prices. One maker asks $21.50, delivered, for his No. 2X. Another has advanced his quotation for eastern Pennsylvania No. 2X from $19.50 to $20, furnace, making the delivered price about $20.75. The Baldwin Locomotive Works has placed orders for about 6000 tons, mainly of what it terms floor iron, or No. 2X. Pipe makers have bought extensively, the largest individual lot reported being about 4500 tons, first quarter delivery. All told, about 25,000 tons of pipe iron has been taken, a considerable part of it being Southern iron. It is not believed that much No. 2 Southern is now available at $14.50, Birmingham, the asking price being $15 to $15.50. Virginia iron is unchanged at $20.25c., delivered, for No. 2X, but the situation is a tighter one, owing to recent buying, and one maker is talking of advancing his prices. A radiator company has taken 10,000 tons of foundry iron, part of which was placed in this district for delivery at Trenton. The Lenoir City Car Works has inquired for 1000 tons. Quotations for standard brands, delivered in buyers' yards, prompt shipment, range about as follows:

Eastern Pa. No. 2 X foundry	$19.75 to $20.00
Eastern Pa. No. 2 plain	19.50 to 19.75
Virginia No. 2 X foundry	20.25
Virginia No. 2 plain	20.00
Gray forge	18.50 to 19.00
Basic	20.00 to 20.50
Standard low phosphorus	36.00 to 37.00

Iron Ore.—The only arrival of iron ore at this port in the week ended Sept. 30 consisted of 7900 tons from Cuba.

Ferroalloys.—Representatives of English producers continue to quote $165, seaboard, for 80 per cent ferromanganese, but those handling the domestic product will accept $164 in many cases, and it is thought probable that even the latter price might be shaded. Makers in this country are casting around for ore. A deal is reported to have been closed for 200,000 tons of Brazilian manganese ore for shipment over 1917, details of which will be found elsewhere. At this port last week 1089 tons of English ferromanganese arrived. Blast-furnace ferrosilicon, 11 per cent, is higher at $35.44, Philadelphia, and 50 per cent material ranges from $87 to $89, Pittsburgh, according to quantity.

Plates.—Private shipbuilding yards have been supplied with quotations on the plates and shapes required for the execution of the Government naval program, and are now formulating their estimates, which are to be submitted Oct. 25. The pressure on the mills is increasing, and business with Spain, Japan and England has been turned down. Other export business has been taken at 4c., Pittsburgh, and higher. Domestic consumers are placing contracts which must be specified in the first half. Where early deliveries are made they command premiums over 4c., Pittsburgh, or 4.159c., Philadelphia. A new steel company at Pottstown, Pa., is installing a flanging department which will be ready for operation about the first of the year. One eastern Pennsylvania mill is under the general market on plates of limited size, quoting down to 3.159c., Philadelphia.

Bars.—At 2.759c., Philadelphia, the nominal quotation for steel bars is unchanged, but the actual price is 2.909c., Philadelphia, or higher. Both domestic and foreign demand for iron bars is active, and the quotation is very firm at 2.659c., Philadelphia.

Structural Material.—Contradictory reports are heard as to the placing of the contract for the Philadelphia Electric Company at Chester, Pa., requiring about 6000 tons. Rumor has given the contract to the American Bridge Company. No new propositions have been consummated, but the general demand for shapes continues extremely good. To preferred customers one mill quotes a minimum of 2.859c., Philadelphia, and to others up to 3.159c., according to deliveries, etc. Another maker quotes 2.909c., Philadelphia.

Billets.—Open-hearth rerolling billets are quoted at $48 to $55, Eastern mill, and forging steel at $65. Export interests continue to comb the market for steel.

Sheets.—The quotations for No. 10 blue annealed range from 3.159c. to 3.409c., Philadelphia, but the market is stronger.

Coke.—Shipments of coke are being made slowly. For spot, furnace, makers are asking up to $4, and some taking $3.50. Some makers ask $3.75 for prompt foundry. The general range of quotations follow: $3.25 to $3.50 per net ton at oven for spot furnace; $3 for contract furnace; $3.50 to $3.75 per net ton at oven for prompt or contract foundry. Freight rates from the principal producing districts are as follows: Connellsville, $2.05; Latrobe, $1.85 and Mountain, $1.65.

Old Material.—The embargoes against the plate mills in Coatesville have been raised and a freer movement of scrap to that point will ensue at once. Heavy melting steel is stronger in reflection of the buying at Pittsburgh. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking freight rates from $35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$15.00 to $15.50
Old steel rails, rerolling	18.00 to 18.50
Low phos. heavy melting steel scrap	21.25 to 23.50
Old steel axles (for export)	35.00 to 36.00
Old iron axles (for export)	35.00 to 36.00
Old iron rails	20.00 to 20.50
Old carwheels	15.50 to 16.00
No. 1 railroad wrought	21.00 to 22.00
Wrought-iron pipe	15.50 to 16.00
No. 1 forge fire	12.00 to 12.50
Bundled sheets	12.00 to 12.50
No. 2 busheling	10.50 to 11.00
Machine-shop turnings	7.50 to 8.00
Cast borings	9.50 to 10.00
No. 1 cast	16.00 to 16.50
Grate bars, railroad	11.75 to 12.25
Stove plate	11.75 to 12.25
Railroad malleable	13.50 to 14.00

Birmingham

BIRMINGHAM, ALA., Oct. 2, 1916.

Pig Iron.—Furnace operators here all ask $15 for deliveries in the first half of 1917. The lead was taken by the Sloss-Sheffield Steel & Iron Company about Sept. 22, and all were practically in line in the next few days. One interest, which had sold 10,000 tons for 1917 delivery at $14.50 during the first two days of the last week in the month, booked as much more for the same delivery during the remainder of the week at $15. The largest foundry interest, after turning down offers of at least 30,000 tons at $14.50, booked 25,000 tons at $15 in two days. The deliveries cover the South, Middle West and Northwest. One small interest has been forced to withdraw from the market on account of capacity sold up. September sales were large. One foundry-iron maker sold 100,000 tons, another 50,000 tons, another 40,000 tons, and so on. Bookings in the past six weeks have approximated 400,000 tons, much of which is basic. The Woodward Iron Company puts its second furnace on basic this week. For spot iron the same price is asked as for forward, but regular customers and attractive business may possibly secure some immediate iron at $14.50. The one certain thing is that furnace iron for 1917 is firm at $15, with a tendency to advance. Some more iron was taken for Norway. Attention is now confined to shipments. The car shortage bids fair to remain embarrassing until November, by which time relief is expected, owing to the probable early movement of the small cotton crop. A shipment of 3000 tons for Italy was made the past week, and there were other export movements. Production remains at the record-breaking point of the past ten months, which is 2,500,000 tons per annum for Alabama. Warrant stocks have gone down to 80,000 tons, much of which is consumers' iron. We quote, per gross ton, f. o. b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$15.00 to $15.50
No. 2 foundry and soft	14.50 to 15.00
No. 3 foundry	14.00 to 14.50
No. 4 foundry	13.75 to 14.25
Gray forge	13.50 to 14.00
Basic	14.50 to 15.00
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—If the leading interest secures all or a portion of the order of 60,000 tons of water pipe to be awarded by Buenos Ayres this month, its Bessemer plant will share largely in the production. This interest has not made additional large bookings, but

the aggregate has been considerable in tonnage. Reports from the pipe field are of generally satisfactory conditions. We quote the recently advanced prices, per net tons, f. o. b., yards, as follows: 4-in., $29; 6-in. and upward, $26, with $1 added for gas pipe and 16-ft. lengths.

Coal and Coke.—Coal is active at slightly better prices, with cars scarce and customers clamoring for delivery. The demand for coke continues greater than the output and prices are firm. Furnaces continue to take much coke made by independents. Shipments to Texas are large. We quote, per net ton, f. o. b. oven, as follows: Standard beehive foundry, $4.25 to $4.50 for forward and regular contracts and $4.75 for spot; furnace coke, $3.25 to $3.50.

Old Material.—The scrap market seems to be steadying around the recently raised prices. While orders are absent from steel billet-making plants, which provide their own scrap, activity in foundries more than compensates. Wrought, however, is in greatest demand. The week's business was of fairly good volume. We quote, per gross ton, f. o. b. dealers' yards, as follows:

Old steel axles	$25.00 to $30.00
Old steel rails	11.50 to 12.00
No. 1 steel scrap	10.50 to 11.00
No. 1 wrought	12.50 to 13.00
No. 1 cast	11.00 to 11.50
Stove plate and light	8.75 to 9.25
Carwheels	11.50 to 12.00
Tram carwheels	11.00 to 11.50

St. Louis

ST. LOUIS, MO., Oct. 2, 1916.

Coke—There is little activity, all the consumers being well covered. The small purchases are rather below the market. By-product coke is held on a parity with Connellsville figures.

Old Material—The market continues very strong, both because of the activity of steel foundries and mills and of the anxiety of dealers to fully cover themselves against their contracts. The steel consumers are entering the market and buying readily at such prices as suit them and these prices are higher than figures which were turned down by them not long ago. There seems to be a fear that a serious shortage is prevailing and this is helping dealers to maintain their prices and encouraging the customers to pay the figures asked. Rolling mills are not as actively in the market as they were and in some instances embargoes have been declared for the time being. No lists are out, although the usual monthly offerings will be made by the railroads during the week. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton

Old iron rails	$17.50 to $18.00
Old steel rails, rerolling	17.00 to 17.50
Old steel rails, less than 3 ft.	17.00 to 17.50
Relaying rails, standard section, subject to inspection	24.00 to 26.00
Old carwheels	12.50 to 13.00
No. 1 railroad heavy melting steel scrap	16.00 to 16.50
Heavy shoveling steel	15.00 to 15.50
Frogs, switches and guards cut apart	15.75 to 16.25
Bundled sheet scrap	8.25 to 8.75

Per Net Ton

Iron angle bars	$17.25 to $17.75
Steel angle bars	15.00 to 15.50
Iron car axles	27.50 to 28.00
Steel car axles	31.00 to 32.00
Wrought arch bars and transoms	22.00 to 22.50
No. 1 railroad wrought	16.50 to 17.00
No. 2 railroad wrought	16.00 to 16.50
Railroad springs	16.00 to 16.50
Steel couplers and knuckles	16.00 to 16.50
Locomotive tires, 42 in. and over, smooth inside	21.50 to 22.00
No. 1 dealers' forge	13.25 to 13.75
Cast-iron borings	7.25 to 7.75
No. 1 busheling	14.50 to 15.00
No. 1 boilers, cut to sheets and rings	10.50 to 11.00
No. 1 railroad cast scrap	12.50 to 13.00
Stove plate and light cast scrap	9.25 to 9.50
Railroad malleable	11.00 to 11.50
Agricultural malleable	10.00 to 10.50
Pipes and flues	11.00 to 11.50
Heavy railroad sheet and tank scrap	11.00 to 11.25
Railroad grate bars	10.00 to 10.50
Machine shop turnings	7.50 to 8.00

Pig Iron—The buying movement which set in here last month has continued during the past week. Several furnace representatives report little iron available for the remainder of this year and the first quarter of next. The smaller consumers have, apparently, become alarmed over the prospects. One furnace representative claims he could sell in a single day 20,000 tons of Southern iron at the going prices. Such sales as were made ranged from 1000 tons downward and aggregated probably 10,000 tons for the week.

Finished Iron and Steel—The demand continues about the same as for some time past. Deferred deliveries do not prevent the placing of orders, but no large contracts are noted. The warehouses are being resorted to to meet immediate needs regardless of the cost of such material. We quote for stock out of warehouse as follows: Soft steel bars, 3.30c; iron bars, 3.20c to 3.25c; structural material, 3.30c; tank plate, 3.80c; No. 10 blue annealed sheets, 3.45c; No. 28 black sheets, cold rolled, one pass, 3.60c; No. 28 galvanized sheets, black sheet gage, 5.05c; this latter quotation having been advanced because of steel conditions rather than spelter prices.

Cincinnati

CINCINNATI, OHIO, Oct. 4, 1916.—(*By Wire.*)

Pig Iron.—The past week was a very active one. A large tonnage of both Southern and Northern iron changed hands. Southern prices are much firmer. The majority of furnaces are quoting $15, Birmingham basis, for this year's shipment, but there is yet some No. 2 foundry iron obtainable at $14.50 both from furnace operators and speculators. One furnace has advanced its quotation to $16, and others are said to be contemplating the same move. Basic iron for delivery before July 1 is scarce, and a nearby consumer has bought 20,000 tons from a Lake furnace, shipments from Nov. 1, this year, to June 30, next year. Another sale, of 2000 tons, of Northern basic was made in this territory for delivery this year. Foundry iron melters apparently are also anxious to get under cover, and business booked last week by different sales agencies justifies this statement. In central Ohio quite a number of sales of Southern foundry iron were made for first half shipment, chief among which were two 1000-ton lots, and a local melter also took 1000 tons for the same delivery. Several 500-ton sales of Southern iron were made to Indiana and Michigan melters. The small lot business in this territory for delivery this year has been surprisingly good. Furnaces in the Hanging Rock district have their books well filled for this year but have been taking some business for foundry iron, with sales confined mostly to Michigan territory and to nearby melters why buy on an analysis basis. The Ohio silvery irons have been especially active. Two sales of 1200 and 1500 tons, respectively, were made to Michigan manufacturers and other smaller contracts were consummated with Indiana and Ohio buyers, with shipments extending through the first half of next year. Based on an 8 per cent analysis, the minimum price is $27 at furnace. The Southern high silicon irons are quoted at $22, Birmingham. Quite a lot of Lake Superior charcoal iron has been contracted for lately, the largest order being for 6000 tons for a Michigan manufacturer, with shipments extending to July 1. The general inquiry is light and business is transacted mostly with selling agencies direct. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	$17.90 to $18.40
Southern coke, No. 2 f'dry and 2 soft.	17.40 to 17.90
Southern coke, No. 3 foundry	16.90 to 17.40
Southern coke, No. 4 foundry	16.40 to 16.90
Southern gray forge	15.90 to 16.40
Ohio silvery, 8 per cent silicon	28.26 to 28.76
Southern Ohio coke, No. 1	21.26 to 21.76
Southern Ohio coke, No. 2	20.26 to 20.76
Southern Ohio coke, No. 3	19.76 to 20.26
Southern Ohio malleable Bessemer	20.26 to 20.76
Basic, Northern	20.26 to 20.76
Lake Superior charcoal	21.20 to 22.20
Standard Southern carwheel	24.90 to 25.40

(*By Mail*)

Finished Material.—Prices for prompt delivery on all kinds of finished material are very firm and in many cases premiums are being paid. The local warehouses are receiving requests for quotations on less than carload lots of steel shafting as well as the common sizes of steel bars from Southern buyers and the local de-

mand is also very heavy. Structural shapes and twisted reinforcing concrete bars are needed badly and at present it is more a question of delivery than of price. The call for both black and galvanized sheets is taxing the resources of nearby mills which are now having trouble in taking care of their old customers. We quote No. 28 black sheets at 3.40c., Cincinnati or Newport, Ky., and No. 28 galvanized sheets at 4.65c. The store price on No. 10 blue annealed sheets is now 3.50c. The warehouse price of wire nails is unchanged at $2.85 per keg base; barb wire, $3.70 per 100 lb.; steel bars and structural shapes, 3.35c.; twisted steel bars, 3.50c.; cold rolled steel rounds, 2-in. and larger, 3.90c.

Coke.—The car shortage has had considerable influence in advancing the price of prompt coke. Some Connellsville 48-hr. coke that was loaded on cars brought as high as $3.40 per net ton at over and 72-hr. coke $3.75. Foundry coke is quoted at $3.50 to $3.75 per net ton at oven, except New River, which is held at $3.90 to $4.

Old Material.—There has been a better demand for wrought scrap, and as a consequence prices have been advanced on various grades. For instance, old iron rails and rerolling steel rails have been marked up $1 per ton, while advances have been made on No. 1 railroad wrought scrap and iron axles. A slight improvement is noted in the demand for borings and turnings, which are now quoted about 25c. per ton higher. The following are dealers' prices, f.o.b. at yards, southern Ohio and Cincinnati:

	Per Gross Ton	
Bundled sheet scrap	$11.50 to	$12.00
Old iron rails	17.50 to	18.00
Relaying rails, 50 lb. and up	22.75 to	23.25
Rerolling steel rails	16.00 to	16.50
Heavy melting steel scrap	15.00 to	15.50
Steel rails for melting	14.50 to	15.00
	Per Net Ton	
No. 1 railroad wrought	$15.00 to	$15.50
Cast borings	4.75 to	5.25
Steel turnings	5.00 to	5.50
Railroad cast	12.00 to	12.50
No. 1 machinery cast	14.00 to	14.50
Burnt scrap	9.00 to	9.50
Iron axles	27.75 to	28.75
Locomotive tires (smooth inside)	22.00 to	22.50
Pipes and flues	10.00 to	10.50
Malleable and steel	11.75 to	12.25
Railroad tank and sheet	9.25 to	9.75

New York

NEW YORK, Oct. 4, 1916.

Pig Iron.—Interest in pig iron is largely centered in heavy purchases of steel-making grades for export. The American representative of the British Government has bought approximately 30,000 tons more low phosphorus iron from Eastern furnaces in the past few days, making the total amount secured in the last two weeks about 60,000 tons. Foreign interests were constrained to accept some high sulphur metal, the supply of standard low phosphorus available being inadequate to meet requirements. The prices paid ranged from $28 per ton for low grade to $35, at furnace, for standard specifications. Shipments are to be made over the remainder of this year and through several months of 1917. Large sales of Southern basic also were made for export, presumably to Great Britain and to France. Upward of 50,000 tons came to the surface in the last day or two. One Alabama blast furnace interest has sold close to 200,000 tons, through Eastern export agents, on this movement and the other Southern basic producing interest is credited with having sold over 100,000 tons, but has refused to accept additional orders needing the metal for its own steel plant. Exporters are said to have induced some other Southern furnaces to turn from foundry to basic ore to meet pressing foreign needs. If this proves correct the upward movement in prices of foundry grades—more pronounced in the past week—is likely to be accelerated. Another interesting statement is that large sales of Southern basic have been made for shipment into the Pittsburgh territory to compensate for the inroads made upon supplies there by recent sales for foreign shipments. Numerous small sales of foundry and special analysis iron have been made to neutral countries, including Norway, Sweden, Denmark, Holland, Greece and South America. Domestic consumers of foundry grades are purchasing more freely, Buffalo furnaces having taken orders for 25,000 tons for Eastern shipment in the last quarter of this year and through the first half of 1917. Early sales last week were made at $19 to $19.50, furnace, and later at $20; some exceptional sales were made at $20.50, furnace. Several of the eastern Pennsylvania furnaces contend that higher prices must prevail because of the rising cost of production due to scarcity of coke, expressed in higher prices, and to the higher labor wage scale. A Connecticut foundry interest has bought moderately against an inquiry for 20,000 tons of malleable Bessemer. An eastern Pennsylvania manufacturer has taken 1000 tons of basic at $20, for shipment in the next six months. A furnace manufacturer in New Jersey has placed a supplementary order for 1500 tons of No. 2 X foundry. An Elizabethport consumer has closed for 2000 tons, foundry grades, and a radiator manufacturer has bought 5000 tons for Trenton delivery. A soil pipe foundry has come into the market for several thousand tons for Baltimore delivery, having provided for the Newark plant. We quote at tidewater for early delivery: No. 1 foundry, $20.50 to $21; No. 2 X, $20 to $20.50; No. 2 plain, $19.75 to $20; Southern iron at tidewater, $20 to $20.50 for No. 1 and $19.75 to $20 for No. 2 foundry and No. 2 soft.

Ferroalloys.—Little new demand for ferromanganese is in evidence. Only a few sales of small lots, aggregating less than 1000 tons, have been made the last week. These have gone at the prevailing quotations of $164, seaboard, for the British alloy and $165, delivered, for the domestic product. Both grades have been sold. Specifications on contracts are insistent and indications are that arrivals, which are very good from England, are being consumed quickly. Most dealers are behind on their contract deliveries. Spiegeleisen is quiet, though about 2000 tons have been sold to both foreign and domestic consumers. The foreign sales went at $45, furnace, for early delivery. Forward delivery material can probably be obtained for less. Ferrosilicon, 50 per cent, is active and strong; consumption and delivery on contract are brisk. Bessemer ferrosilicon is in strong demand, with good sales reported at $31 per ton, furnace, for the 10 to 11 per cent; $32 for the 11 to 12 per cent; $33 for the 12 to 13 per cent alloy. The 14 to 15 per cent alloy is commanding $45 per ton, furnace. Ferrovanadium is active and strong at $2.75 to $3, Pittsburgh, per pound of contained vanadium. Ferrotungsten has recently sold at $2.60 to $2.75, New York, per pound of contained tungsten. Ferrocarbon-titanium is quoted at 8c. per pound in carload lots, 10c. per pound in ton lots and 12½c. per pound in lots less than a ton. Ferrochrome, 60 to 70 per cent, is unchanged at 16c. to 20c., New York, per pound of contained chromium.

Structural Material.—Sales of fabricated structural steel in September were substantially larger than in August, the gain being estimated at 10 to 12 per cent. The prospect for October is even more encouraging from the standpoint of volume, although there is less activity in building projects in the New York Metropolitan district in point of number. The most important development is the closing of a contract for 15,000 tons of shapes for the New York Central Hotel, awarded to the American Bridge Company. It is also interesting to note that about 6000 tons more steel may be ordered for the Pennsylvania Railroad Hotel, making the total 18,000 tons. Plans for each of these structures, however, may be modified in the near future. The contract for 6000 tons steel for the power house at Chester, Pa., reported to have been awarded to the American Bridge Company is still held in the balance. George D. Wyn, who has been awarded the general contract for the Norfolk Navy Yards buildings by the Government, having obligated himself to complete the work in 180 days, has given the order for the 4000 tons of structural steel required to the McClintic-Marshall Company. The latter company also has been awarded the contract for 1650 tons of steel

for the car storage buildings at 239th Street, New York City. Railroad bridge work is developing in large volume, but thus far only small orders have been placed. The Southern has placed 300 tons for four turntables to the Phoenix Bridge Company. The New Haven will take bids about the middle of the month on the superstructure of the Thames River bridge, requiring 4000 to 8000 tons. The Hammermill Paper Company has placed 400 tons at Erie, Pa., with the Pittsburg Bridge & Iron Works. About 500 tons steel for an extension to the J. B. Bucks, Jr., building at Detroit will be fabricated by the Russel Wheel & Foundry Company. Numerous small orders have been placed for buildings in this city, including 225 tons for the Hebrew Social Center, at 131 West Eighty-sixth Street, with the Hinkle Iron Works; 125 tons for the Baker & William warehouse, at 519 West Twentieth Street, with the Levering & Garrigues Company, and 150 tons for the Defiance Mfg. Company, at 32 East Forty-second Street, reported to have gone to Post & McCord. The Central Railroad of New Jersey is reported to be preparing plans for a station at Newark requiring 600 tons; bids to be taken Oct. 15. Tenders will be submitted to-morrow on 150 tons shapes for U. S. Arsenal at Watervliet, N. Y. We quote mill shipments of plain structural material at 2.769c. to 3.019c., New York, 2.869c. minimum for largest lots for fair delivery, and warehouse shipments, which have advanced $2 per ton, at 3.35c., New York.

Steel Plates.—The pressure for marine plates is increasing rather than otherwise, although the mills have capacity sold for the next nine to fifteen months. The Steel Corporation subsidiaries have taken on additional orders for upward of 75,000 to 100,000 tons, which, with previous sales and reservations, take up mill capacity for the whole of 1917. Independent plate mills report orders booked equal in tonnage to six to nine months' capacity, yet inquiries for 100,000 tons are in the market, half of which are for export. Jose Marimon, of Cuba, has placed an order for 11,000 tons plates with a Western mill for boats to be constructed in this country, and is still negotiating for about 37,000 tons. The order for 6 and 8 in. pipe placed by the Sinclair Oil & Refining Corporation requires 60,000 tons of plates. One small Eastern shipyard is trying to buy 1000 tons plates, together with 500 tons shapes. The foreign inquiries include 10,000 tons of plates, with 15,000 tons of shapes, for shipment to Great Britain; 15,000 tons plates for Italy; 10,000 tons plates, with 15,000 tons shapes, for Japan, and 8000 to 10,000 tons plates and shapes for China. The latter inquiry comes from British merchants. The demand for small lots for reasonably early shipment is urgent, but scarcely any are available even at 5c. per pound, base, Pittsburgh. Wide plates are difficult to buy before the third quarter of 1917, and command 4c., Pittsburgh. Plates up to 7 ft. in width likewise take 4c., but deliveries may be made in 6 to 8 weeks, while universal plates are not in good demand and may be obtained in a few weeks and at 3.50c., Pittsburgh. Warehouse prices range from 4c. to 4.50c., New York.

Iron and Steel Bars.—A strong tone prevails and prices are higher. The Cambria Steel Company late yesterday advanced prices $3 per ton to 2.75c., base, Pittsburgh. Others are asking 2.60c., base, but will take orders only at "convenience of the mill"; capacity has been sold well through the third quarter of 1917, according to information obtainable here. The domestic demand is active on small lots, and has been throughout the week. Italy, unable to buy 45,000 tons billets for the manufacture of shells, has taken 40,000 tons of mild steel. One interest sold 20,000 tons, including 15,000 tons for shipment over the last quarter of this year and 5000 tons for export in the first quarter of 1917. The other half was bought in small lots. It is difficult to buy steel bars under 2.869c. to 2.919c., New York, or under 3.50c. from store, which is minimum at 3.25c. Iron bars are stronger at 2.669c. and 3.25c., New York, respectively, for mill and warehouse shipments.

Cast-Iron Pipe.—The largest public letting advertised for a long time is that of the city of Detroit, which will buy 30,430 tons of 36 to 48-in., principally of the larger sizes. Proposals will be opened Oct. 10. New York City will open bids on two contractors' jobs Oct. 10 which will involve the purchase of a total of 1200 tons. While municipal lettings in this vicinity are few, private buying is maintained in quite good volume. Some inquiries and an occasional purchase are appearing for spring delivery. Carload lots of 6-in. class B and heavier are firm at $31.50 per net ton, tidewater, with $1 per ton extra for class A and gas pipe.

Old Material.—The tone of the market is strong, the belief being prevalent that an early improvement will be felt in the demand and that prices will be higher. Iron rolling mills in eastern Pennsylvania are still buying good quantities of wrought scrap and other rolling-mill stock, and a better demand for heavy melting steel scrap is being experienced from western Pennsylvania. While the embargo has been lifted at Coatesville, Pa., the steel companies there are limiting shipments on contracts. It is believed, however, that the near future will see a much better movement, accompanied by renewed buying. Heavy melting steel scrap for Pittsburgh is bringing $14 to $14.25, New York, and steel scrap intended for eastern Pennsylvania is slightly higher than in recent weeks. Brokers quote buying prices for the Eastern trade about as follows to local dealers and producers, per gross ton, New York:

Heavy melting steel scrap (eastern Pennsylvania specifications)	$12.00 to $12.50
Old steel rails (short lengths) or equivalent	12.75 to 13.00
Relaying rails	28.50 to 29.00
Rerolling rails	17.50 to 18.00
Iron and steel car axles (for export)	38.50 to 39.00
No. 1 railroad wrought	19.75 to 20.00
Wrought-iron track scrap	16.75 to 17.00
No. 1 yard wrought, long	14.50 to 15.00
Light iron (nominal)	3.50 to 4.00
Cast borings (clean)	7.00 to 7.50
Machine shop turnings (nominal)	5.50 to 5.75
Mixed borings and turnings (nominal)	5.50 to 5.75
Wrought pipe	13.00 to 13.50

Foundries continue to buy moderately. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

No. 1 cast (machinery)	$16.00 to $16.50
No. 2 cast (heavy)	14.00 to 14.50
Stove plate	11.50 to 12.00
Locomotive grate bars	10.00 to 10.50
Old carwheels (nominal)	15.00
Malleable cast (railroad)	12.00 to 12.50

Cleveland

CLEVELAND, OHIO, Oct. 3, 1916.

Iron Ore.—Lake ore shipments in September amounted to 9,600,786 gross tons, showing only a slight falling off as compared with August, when the movement was 9,850,140 tons. The total movement up to Oct. 1 was 48,816,650 tons, or only a little behind the record-breaking season of 1913, with 49,070,478 tons. Based on the shipments so far, it is now estimated that the total for the season will reach 63,000,000 tons. This is the first year that the capacity of the Lake fleet has ever been tested. Although the movement continues heavy, the vessel situation has eased off somewhat and more wild tonnage for ore is being offered than earlier in the season. Some of the fleets will clean up fairly well on their contracts this month and it is expected there will be plenty of vessel tonnage available to supply the late demand. Some additional chartering is reported at the regular rate of $1 per ton. Additional reservations of ore for next year are being made. Some of the ore firms estimate that the advance in cost of production, including the higher Lake rates, will be from 60c. to 70c. per ton next year, as compared with this year, and think that the advance in ore prices should be close to $1 per ton. We quote 1916 prices as follows for delivery at lower Lake ports: Old range Bessemer, $4.45; Mesaba Bessemer, $4.20; old range non-Bessemer, $3.70; Mesaba non-Bessemer, $3.55.

Pig Iron.—The market is very active, particularly in steel-making grades. Sales reported by Cleveland interests include one lot of 10,000 tons of basic and another large lot for first quarter delivery at $19.50, and several other lots aggregating 25,000 tons of basic. One Cleveland selling agency is now asking $20 for

basic. We note the sale of 1000 tons of Bessemer at $22 for first half delivery and another sale of 10,000 tons of Bessemer. The Cleveland market is very firm at $19 for foundry, basic, and malleable iron, and one producer has advanced its price to $19.50, delivered, Cleveland, for the three grades. Toledo prices are firm, but the price advances for shipment from that point have not been as rapid as in some other centers. The minimum Toledo prices are now $19 on basic, foundry and malleable iron. The demand in this territory for foundry iron is quite active and most consumers are now covered for their first half requirements. Detroit stove foundries have been active buyers the past few days. Southern iron is fairly active in lots up to 500 tons, mostly for first half delivery. Sales are reported at $15, Birmingham, for No. 2 for first half and $14.50 for the remainder of the year, these prices being quoted by most producers. Ohio silvery iron is firm. One producer has made sales at $27.50, or 50c. above recent price, and is now asking $28 for 8 per cent. We quote, delivered, Cleveland, as follows:

Bessemer	$22.95 to $23.45
Basic	19.50
Northern No. 2 foundry	19.30 to 19.50
Southern No. 2 foundry	18.50 to 19.00
Gray forge	19.00
Jackson Co., silvery 8 per cent silicon	28.62 to 29.12
Standard low phos., Valley furnace	33.00

Coke.—The market is firm but quiet. Some producers have advanced their prices for standard Connellsville foundry coke to $4 per net ton at oven for prompt shipment and for delivery up to July. We quote standard Connellsville foundry coke at $3.50 to $4 per net ton at oven for prompt shipment and contract. Connellsville furnace coke is held at $3.25 at oven for prompt shipment.

Finished Iron and Steel.—New demand for small lots of finished material continues fairly active, particularly for plates. The plate market is even firmer than it has been, and its strength is indicated by the fact that an Ohio tank shop has taken 900 tons of tank plates at 4c., Pittsburgh, for fourth quarter delivery, this being the minimum price for wide plates except for extended future shipment. Plates in narrow widths are quoted around 3.25c. to 3.50c. for fairly early delivery. We note the sale of 800 tons of standard Bessemer rails to an industrial company for prompt shipment at $50 per ton. An inquiry is pending from the Lake Shore Electric Railway for 600 tons of standard rails. In structural lines a great deal of work is coming out requiring less than 100 tons, for which fabricators are able to make rather prompt deliveries, but no large building work has been placed recently. The bar-iron market is firm at 2.50c. to 2.60c., Pittsburgh, and local mills are well filled with orders. The sheet market continues active, with considerable irregularity in prices. While most mills are quoting 3c. as the minimum price for black and blue annealed sheets, the 2.90c. price has not disappeared, and, on the other hand, sales are being made as high as 3.25c. We quote sheets at 2.90c. to 3.25c., Ohio mill, for No. 28 black and No. 10 blue annealed, and 4.25c. to 4.40c. for No. 28 galvanized. Warehouse prices are 3.40c. for steel bars and structural material, 3.75c. for plates and 3.25c. for iron bars.

Bolts, Nuts and Rivets.—The demand for bolts and nuts continues active. Some consumers are in the market for their first half requirements. Sales have been made for first quarter delivery, but some manufacturers are unwilling to take orders for shipment beyond the first quarter. Rivet prices are unchanged at 4c., Pittsburgh, for structural and 4.10c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, ⅝ x 6 in., smaller or shorter, rolled thread, 50 and 5; cut thread, 40, 10 and 2½; larger or longer, 35 and 2½; machine bolts within h. p. nuts, ⅝ x 4 in., smaller and shorter, rolled thread, 50 and 10; cut thread, 50; larger and longer, 40 and 5; lag bolts, gimlet or cone point, 50 and 5; square h. p. nuts, blank or tapped, $2.70 off the list; hexagon h. p. nuts, blank or tapped, $2.70 off; c. p. c. and t. sq. nuts, blank or tapped, $2.40; hexagon nuts, all sizes, $2.80 off; cold pressed semi-finished hexagon nuts, all sizes, 60 and 5.

Old Material.—The market is not active but firm. The advance in pig-iron prices has had an effect on scrap prices and advances have been made on several grades. A Canton consumer is inquiring for steel-making scrap, being the only mill in this territory that is actively in the market. However, there is considerable demand from dealers who are covering on contracts and buying for stock with the expectation of higher prices. Busheling has again advanced to $13, this price being offered by dealers. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Steel rails	$15.25 to $15.75
Iron rails	18.50 to 19.00
Steel car axles	32.00 to 33.00
Heavy melting steel	16.25 to 16.75
Carwheels	12.75 to 13.00
Relaying rails, 50 lb. and over	25.00
Agricultural malleable	12.50 to 12.75
Railroad malleable	14.25 to 14.50
Steel axle turnings	12.00 to 12.50
Light bundled sheet scrap	12.00 to 12.25

Per Net Ton

Iron car axles	$26.00 to $27.00
Cast borings	6.25 to 6.50
Iron and steel turnings and drillings	5.50 to 5.75
No. 1 busheling	13.00 to 13.25
No. 1 railroad wrought	15.50 to 16.00
No. 1 cast	13.25 to 13.75
Railroad grate bars	10.25 to 10.75
Stove plate	10.00 to 10.25

Buffalo

BUFFALO, N. Y., Oct. 3, 1916.

Finished Iron and Steel.—Mills and selling agencies report that September was the heaviest month for specifications for several months. Users generally are endeavoring to anticipate their spring requirements, but it is probable that deliveries on such requirements will not be made until well into the second quarter. The domestic demand is so great that it is almost impossible to get orders on the mills' books for export, domestic business being given preference by sellers.

Old Material.—The scrap market is showing strength, with a larger demand for heavy melting steel, low phosphorus steel, No. 1 railroad wrought, cast scrap, old carwheels and wrought pipe. Heavy melting steel, No. 1 railroad wrought and wrought pipe have each advanced $1 per ton and old carwheels 50c. Dealers consider the outlook bright for a still further rise, based on the present very active market. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$17.00 to $17.50
Low phosphorus steel	21.00 to 21.50
No. 1 railroad wrought scrap	18.50 to 19.00
No. 1 railroad and machinery cast scrap	16.00 to 16.50
Steel axles	32.00
Iron axles	32.00
Carwheels	13.50 to 14.00
Railroad malleable	15.50 to 16.00
Machine shop turnings	6.00 to 6.50
Heavy axle turnings	12.00
Clean cast borings	7.50 to 7.75
Iron rails	18.00 to 18.50
Locomotive grate bars	11.50 to 12.00
Stove plate (net ton)	11.50 to 12.00
Wrought pipe	13.00 to 13.50
Bundled sheet scrap	11.50 to 12.00
No. 1 busheling	13.00 to 13.50
No. 2 busheling	11.00 to 11.50
Bundled tin scrap	15.00 to 15.50

Pig Iron.—The business of the past week has been large, totaling 30,000 to 35,000 tons of all grades, including Bessemer and charcoal, with a considerable tonnage of special irons, ferrosilicon and fluorspar. Inquiry aggregates over 25,000 tons. One of the largest producers is now adhering to a range of $19 to $20 for all grades; another has raised its minimum for any grade to $20, furnace; and another, one of the largest, announces that it is entirely out of the market, and will not sell at any price for first half delivery. Practically all resale iron has been eliminated from the market as less than 3000 tons remains unsold, while of this not over 20 per cent is available at present market prices. The Donner Steel Company has leased for three years, with an option to purchase, the property of the Tonawanda Iron & Steel Company, on the Niagara River at North Tonawanda, and will immediately put one of the furnaces in condition for the manufacture of ferromanganese. This will take the two stacks of this company out of the column of merchant furnaces in

the Buffalo district. We quote as follows, f.o.b. Buffalo, for delivery to and including the first half of 1917:

No. 1 foundry	$19.50 to $20.00
No. 2 X foundry	19.25 to 20.00
No. 2 plain	19.00 to 20.00
No. 3 foundry	19.00 to 20.00
Gray forge	19.00 to 20.00
Malleable	19.25 to 20.00
Basic	20.00 to 20.50
Bessemer	22.00
Charcoal, regular brands and analysis	21.00 to 22.00

Iron and Industrial Stocks

NEW YORK, Oct. 4, 1916.

For the greater part of the past week the furious activity on the Stock Exchange continued. Prices of securities, however, made few new records, wide fluctuations showing a great deal of profit taking. No fear appears to be entertained of an early collapse in values. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	25¼- 27¾	Pressed Stl., com.	60 - 70
Allis-Chal., pref.	80¾- 83⅝	Pressed Stl., pref.	104 -104⅞
Am. Can, com...	64¼- 68½	Ry. Stl. Spring, com.	51½- 56½
Am. Can, pref...	114 -115⅝	Ry. Stl. Spring, pref.	100⅞-102
Am. Car & Fdy., com.	66⅛- 73½	Republic, com...	70⅝- 83¾
Am. Car & Fdy., pref.	118 -119	Republic, pref...	111⅝-112¾
Am. Loco., com..	77½- 84½	Sloss, com.....	60 - 65
Am. Loco., pref..	106 -107	Sloss, pref.....	97½- 98
Am. Steel Fdries.	58 - 62⅜	Pipe, com.....	21⅞- 28
Bald. Loco., com.	86⅜- 93⅝	Pipe, pref.....	53¾- 57
Bald. Loco., pref.	106½-108¾	U. S. Steel, com..	114⅞-120⅝
Beth. Steel, com.	554 -569½	U. S. Steel, pref.	120⅝-121⅝
Beth. Steel, pref.	134⅞-137	Va. I. C. & Coke	47½- 56¼
Colo. Fuel.....	56¾- 63¼	Westing. Elec...	64⅛- 65⅞
Deere & Co., pref.	93⅜- 94⅜	Am. Rad., com	400
Gen. Electric....	179 -186¼	Am. Ship, com..	49⅞- 50¼
Gt. No. Ore Cert	43½- 47	Am. Ship, pref..	94 - 95
Int. Harv. of N. J., com.	115¼-117¼	Chic. Pneu. Tool	72½- 75
Int. Harv. of N. J., pref.	118 -119	Cambria Steel...	83 - 88
Int. Harv. Corp., com.	79 - 80½	Lake Sup. Corp..	14 - 15⅞
Int. Harv. Corp., pref.	109	Warwick	9⅝- 9¾
Lacka. Steel.....	84¼- 90	Cruc. Steel, com.	91⅞- 96⅞
Nat. En. & Stm., com.	29 - 31⅜	Cruc. Steel, pref.	121 -122
Nat. En. & Stm., pref.	95¼- 96	Harb.-Walk. Refrac., com.	105 -105¼
N. Y. Air Brake.	145 -160⅞	La Belle Iron, com.	66½ - 74
Pitts. Steel, pref.	103½-105	Can. Car & Fdy., com.	40
		Carbon Stl., com.	86½- 91
		Driggs-Seabury .	90 - 99
		Midvale Steel....	73⅞- 77

Dividends

The Scovill Mfg. Company, regular quarterly, 2 per cent and extra 10 per cent, payable Oct. 1.

The Chicago Pneumatic Tool Company, regular quarterly, 1 per cent, payable Oct. 25.

The Standard Screw Company, extra, 20 per cent on the common stock, payable Oct. 2.

The Westinghouse Electric & Mfg. Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 16, 1½ per cent on the common, payable Oct. 31.

The Linde Air Products Company, dividend of 25 per cent on the common stock, payable Nov. 1.

The New Jersey Zinc Company, 10 per cent, payable Oct. 10. This makes a total of 62 per cent paid by the company so far this year, amounting to $21,700,000.

The General Fireproofing Company, regular quarterly, 1¾ per cent on the common stock and 1¾ per cent on the preferred stock, payable Oct. 1.

The Moline Plow Company, 2 per cent on the common stock, payable Oct. 15. This is the first dividend paid since 1914.

The Steel Company of Canada, regular quarterly, 1¾ per cent on the preferred stock, payable Nov. 1.

The American LaFrance Fire Engine Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 1.

The American Shipbuilding Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 14.

The Pittsburgh Steel Company, 2 per cent on the common stock, payable Oct. 2.

The Sharon Steel Hoop Company, regular quarterly, 1¾ per cent, payable Oct. 1.

The Western Electric Company, regular quarterly, 1½ per cent on the preferred stock and 2 per cent on the common stock, payable Sept. 30.

The Youngstown Iron & Steel Company, regular quarterly, 1¾ per cent on the preferred stock, payable Oct. 1.

The New Albany Chamber of Commerce, New Albany, Ind., is considering a plan to raise a fund with which to purchase available local factory sites. These would be held subject to resale to manufacturers desiring to locate in the city.

Export Rates Not Advanced

WASHINGTON, D. C., Oct. 3, 1916.—As the result of strong protests made by iron and steel manufacturers, the Interstate Commerce Commission on Sept. 29 suspended, pending investigation, tariffs filed by carriers providing for the cancellation of export rates on iron and steel articles from Pittsburgh, Chicago and other points in Central Freight Association and Eastern trunk line territories to Atlantic coast and Gulf ports. The cancellation of these export rates meant substantial increases, it having been proposed to put them on the same basis as domestic freight rates. The carriers filed the tariffs to become effective Oct. 1 and later dates, and the commission has suspended them to Jan. 29. Meanwhile a comprehensive investigation will be conducted by the commission into the whole subject.

The present and proposed rates, carloads, from various points of origin to New York for export, which may be taken as characteristic of the proposed increases, are as follows:

From	Pig Iron, Per Gross Ton	Billets and Blooms Per Gross Ton	Finished Products, Per 100 Lb.
Pittsburgh:			
Present	$1.74	$1.84	$0.11
Proposed	2.58	2.76	0.16
Advance	$0.84	$0.92	$0.05
Chicago:			
Present	$3.36	$3.52	$0.210
Proposed	4.98	5.26	0.315
Advance	$1.62	$1.74	$0.105
Cleveland:			
Present	$2.34	$2.44	$0.140
Proposed	3.18	3.36	0.199
Advance	$0.84	$0.92	$0.059
Cincinnati:			
Present	$2.92	$3.06	$0.183
Proposed	4.34	4.58	0.274
Advance	$1.42	$1.52	$0.091

The commission recently held a preliminary hearing in connection with the proposed increases, at which appeared representatives of leading iron and steel companies who maintained that, while they are now doing a largely increased business, conditions are but temporary and they would require the preferential export rate to meet foreign competition in foreign markets and that their present adjustment should not be disturbed simply because of the extraordinary conditions that exist at this time.

Representatives of the carriers admitted that the withdrawal of their export rates was in the nature of a temporary move, and that when conditions become normal it might be advisable, and probably would be, to restore the lower export rate. The iron and steel men charged at the hearing that the carriers, in seeking to increase export rates by making them the same as domestic rates, were attempting to participate in the present profits on iron and steel products.

Following its action as to Atlantic coast and Gulf rates, the commission, Oct. 2, suspended until Dec. 29 a proposed increase of 50 per cent in rates on iron and steel articles for export through Pacific coast terminals.

W. L. C.

New Railroad Line on Ohio River

The last stretch of unoccupied river frontage on the Ohio River between Pittsburgh and Wheeling is about to be opened up, according to Ralph W. Cooke, industrial agent, Pennsylvania Lines West of Pittsburgh. A new line 12 miles in length is to be constructed by the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad, commencing at Chester, W. Va., and skirting the south bank of the Ohio River east as far as the mouth of Raccoon Creek, which is about three miles below Beaver. The Pan Handle now has a branch, known as its New Cumberland Branch, passing through Weirton, New Cumberland and Chester, and the new line will be a continuation of this branch. It is the intention to have the extension in complete operation some time in the coming year. Ferguson & Edmundson, Pittsburgh, have been awarded the contract for the construction of the first portion of the road. The development will open up sites for manufacturing plants.

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, effective from April 10, 1916, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30.7c.; Birmingham, Ala., 45c.; Pacific coast (by rail only), 65c.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 2.60c. to 2.75c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in., on one or both legs	.10
Angles, 3 in. on one or both legs less than ¼ in. thick, as per steel bar card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, handrail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.30
Handrail tees	.75
Cutting to lengths, under 3 ft. to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Plates.—Tank plates, ¼ in. thick, 6 in. up to 100 in. wide, 3c. to 4c., base, net cash, 30 days, or ½ of 1 per cent discount in 10 days, carload lots. Extras are:

Quality Extras

	Cents per lb.
Tank steel	Base
Pressing steel (not flange steel for boilers)	.10
Boiler and flange steel plates	.15
"A. B. M. A." and ordinary firebox steel plates	.20
Still bottom steel	.30
Locomotive firebox steel	.50

Marine steel, special extras and prices on application.

Gage Extras

	Cents per lb.
Rectangular, 1¼ in. thick, over 6 in. wide to 100 in. wide	Base
Lighter than ¼ in., to 3/16 in., up to 72 in. wide	.10
*Lighter than ¼ in., including 3/16 in., over 72 in. to 84	.20
*Lighter than ¼ in., including 3/16 in., over 84 in. to 96	.30
*Lighter than ¼ in., including 3/16 in., over 96 in. to 100	.40
*Lighter than ¼ in., including 3/16 in., over 100 in. to 102	.45
Lighter than 3/16 in., including No. 8, up to 72 in. wide	.15
*Lighter than 3/16 in., including No. 8, over 72 in. to 84	.25
*Lighter than 3/16 in., including No. 8, over 84 in. to 96	.35
Lighter than No. 8, including No. 10, up to 60 in. wide	.30
Lighter than No. 8, including No. 10, over 60 in. to 64	.35

Up to 72 in. and not less than 10.2 lb. per sq. ft. will be considered ¼ in.
Over 72 in. must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft. to take base price.
Over 72 in. wide, ordered less than 11 lb. per sq. ft., down to weight of 3/16 in., take price of 3/16 in.
Over 72 in., ordered weight 3/16 in., take No. 8 price.
Over 72 in., ordered weight No. 8, take No. 10 price.

Width Extras

Over 100 in. to 110 in. inclusive	.05
Over 110 in. to 115 in. inclusive	.10
Over 115 in. to 120 in. inclusive	.15
Over 120 in. to 125 in. inclusive	.25
Over 125 in. to 130 in. inclusive	.50
Over 130 in.	1.00

Length Extras

Universal plates 80 ft. long up to 90 ft. long	.05
Universal plates 90 ft. long up to 100 ft. long	.10
Universal plates 100 ft. long up to 110 ft. long	.20

Cutting Extras

No charge for rectangular plates to lengths 3 ft. and over.

Lengths under 3 ft. to 2 ft. inclusive	.25
Lengths under 2 ft. to 1 ft. inclusive	.50
Lengths under 1 ft.	1.55
Circles 3 ft. in diameter to 100 in.	.30
Circles over 100 to 110 in. (width extra)	.35
Circles over 110 to 115 in. (width extra)	.40
Circles over 115 to 120 in. (width extra)	.45
Circles over 120 to 125 in. (width extra)	.55
Circles over 125 to 130 in. (width extra)	.80
Circles over 130 in. (width extra)	1.30
Circles under 3 ft., to 2 ft., inclusive	.55
Circles under 2 ft., to 1 ft., inclusive	.80
Circles under 1 ft.	1.85

Half circles take circle extras.

Sketches not over four straight cuts, inc. straight taper	.10
Sketches having more than four straight cuts	.20

Plates sheared to a radius take complete circle extras.

*Including extra for width.

Wire Rods.—Including chain rods, $55 to $60.

Wire Products.—Prices to jobbers effective Aug. 5: Fence wire, Nos. 6 to 9, per 100 lb., terms 60 days or 2 per cent discount in 10 days, carload lots, annealed, $2.55; galvanized, $3.25. Galvanized barb wire and staples, $3.45; painted, $2.75. Wire nails, $2.60. Galvanized nails, 1 in. and longer, $2 advance over base price; shorter than 1 in., $2.50 advance over base price. Cement-coated nails, $2.50. Woven wire fencing, 60 per cent off list for carloads, 59 off for 1000-rod lots, 58 off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	6 to 9	10	11	12&12½	13	14	15	16
Annealed	$2.60	$2.65	$2.70	$2.75	$2.85	$2.95	$3.05	$3.15
Galvanized	3.30	3.35	3.40	3.45	3.55	3.65	4.10	4.20

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect on black pipe from Sept. 7, 1916, and on galvanized pipe from July 24, 1916, all full weight:

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛, ¼ and ⅜	62	35½	⅛ and ¼	51	24
½	66	51½	⅜	52	25
¾ to 3	69	55½	½	56	38
			¾ to 1½	59	43

Lap Weld

2	63	50½	1¼	46	31
2½ to 6	66	53½	1½	52	38
7 to 12	63	49½	2	53	39
13 and 14	63½	..	2½ to 4	55	42
15	51	..	4½ to 6	55	42
			7 to 12	54	41

Reamed and Drifted

1 to 3, butt	67	53½	1¼, lap	41	25
2, lap	61	48½	1½, lap	47	32
2½ to 6, lap	64	51½	2, lap	48	33
¾ to 1½, butt	54	37	2½ to 4, lap	51	36

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	58	40½	⅛, ¼ and ⅜	51	34
½	63	50½	½	56	43
¾ to 1½	67	54½	¾ to 1½	60	45
2 to 3	68	55½			

Lap Weld, extra strong, plain ends

2	61	49½	1¼	48	33
2½ to 4	64	52½	1½	53	39
4½ to 6	63	51½	2	55	42
7 to 8	59	45½	2½ to 4	57	45
9 to 12	54	40½	4½ to 6	56	44
			7 to 8	50	38
			9 to 12	45	33

Butt Weld, double extra strong, plain ends

½	54	43½	½	43	31
¾ to 1½	57	46½	¾ to 1½	46	34
2 to 2½	59	48½			

Lap Weld, double extra strong, plain ends

2	53	43½	1½	42	30
2½ to 4	55	45½	2	42	30
4½ to 6	54	44½	2½ to 4	44	35
7 to 8	49	35½	4½ to 6	43	34

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, freight to destination added, effective from Sept. 7, 1916, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1½ in.	33	1½ in.	25
1¾ and 2 in.	45	1¾ and 2 in.	37
2¼ in.	42	2¼ in.	34
2½ and 2¾ in.	48	2½ and 2¾ in.	40
3 and 3¼ in.	53	3 and 3¼ in.	45
3½ to 4½ in.	54	3½ to 4½ in.	46
5 and 6 in.	47	5 and 6 in.	39
7 to 13 in.	44	7 to 13 in.	36

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., and not exceeding 22 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipments on sheets of U. S. standard gage, in carload and larger lots, are as follows, 30 days net, or 2 per cent discount in 10 days:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	2.95 to 3.05
Nos. 9 and 10	3.00 to 3.10
Nos. 11 and 12	3.05 to 3.15
Nos. 13 and 14	3.10 to 3.20
Nos. 15 and 16	3.20 to 3.30

Box Annealed Sheets, Cold Rolled

Nos. 17 to 21	2.90 to 2.95
Nos. 22 and 24	2.95 to 3.00
Nos. 25 and 26	3.00 to 3.05
No. 27	3.05 to 3.10
No. 28	3.10 to 3.15
No. 29	3.15 to 3.20
No. 30	3.35 to 3.40

Galvanized Sheets of Black Sheet Gage

Nos. 10 and 11	3.25 to 3.35
No. 12	3.35 to 3.45
Nos. 13 and 14	3.35 to 3.45
Nos. 15 and 16	3.50 to 3.60
Nos. 17 to 21	3.65 to 3.75
Nos. 22 and 24	3.80 to 3.90
Nos. 25 and 26	3.95 to 4.05
No. 27	4.10 to 4.20
No. 28	4.25 to 4.35
No. 29	4.40 to 4.50
No. 30	4.65 to 4.75

Metal Markets

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin,	Lead		Spelter	
	Lake	Electro-lytic	New York	New York	St. Louis	New York	St. Louis
Sept.							
27	28.00	28.62½	38.75	7.05	6.85	9.25	9.00
28	28.00	28.50	39.12½	7.10	6.87½	9.37½	9.12½
29	28.00	28.50	39.37½	7.10	6.87½	9.37½	9.12½
30	28.00	28.50	....	7.10	6.87½	9.37½	9.12½
Oct.							
2	28.25	28.50	39.25	7.05	6.85	9.50	9.25
3	28.25	28.50	39.25	7.05	6.85	9.70	9.50

NEW YORK, Oct. 4, 1916.

Copper is quieter but strong. Tin has been active on one or two days, and a good movement is believed to be impending. Lead is steady but less active. Spelter is higher, but buying has not been large. Antimony continues dull, and is lower.

New York

Copper.—As was to be expected, the heavy buying on both foreign and domestic account has tapered off and the market is now comparatively quiet. First hands are well sold up for the remainder of the year and hold their quotations firmly, but there is indication of easiness in resale metal. October electrolytic is quoted at 29c., November at 28.50c., December at 28c., January at 27.50c. and first quarter at 27.25c. A peculiarity of the market is that some producers when asked for nearby quotations will not give them, but if a definite proposition is put up to them negotiations usually follow which result in an agreement to deliver the metal desired. Lake is strong, with November nominal around 28.25c. For spot Lake 29.50c. has been asked, but it cannot be learned that any business was done at this figure. January Lake is held at 27.50c. and first quarter at 27.25c. The brass and copper mills are extremely busy and are taking their choice of the new business that is offered, turning much of it away. The London market for electrolytic is firm at £140, whereas it stood at £138 a week ago. The exports in September totaled 29,803 tons. European statistics just cabled show that the stocks in Great Britain and France, together with quantities afloat from Chile and Australia, Oct. 1 totaled 10,371 tons, against 11,668 Sept. 15, a decrease of 1297 tons in the two weeks.

Copper Averages.—The average price of Lake copper for the month of September, based on daily quotations in THE IRON AGE, was 28.03c., and for electrolytic, 28.28c.

Tin.—The tone of the market is excellent, sales are more regular and steady, and the feeling in the trade is that a good buying movement is not far distant. Last Friday the market took a decided spurt late in the day, and in the course of one hour between 300 and 400 tons was dealt in. The large tin-plate manufacturers were the principal buyers and the selling was confined to but a few hands. Thursday the market was quieter, with small sales amounting to about 100 tons. On Friday not much was done in spite of a fair amount of inquiry. This week more interest has been shown in futures, especially first quarter delivery, but not a great deal has been done since last week. Straits was quoted for prompt delivery at 29.25c. yesterday. The monthly statistics for September show that deliveries of the month totaled 4025 tons, making the total delivery 44,413 tons since Jan. 1, against 36,905 tons in the same period of 1915. At the end of the month there was in stock and landing 4769 tons. The quantity now afloat is 2145 tons.

Lead.—The market has presented a rather mixed aspect. On Wednesday last a good business was done at prices ranging from 7c. to 7.12½c., New York, the independent sellers and producers taking most of the business. Since then there has been less activity and the metal was easily obtainable yesterday at 7.05c., New York. The leading interest continues to quote 7c., New York, and 6.92½c., St. Louis. Independents yesterday quoted 6.85c., St. Louis. Some sections of the trade have indulged in a great deal of bullish talk over prices, but those who are more conservative believe that present quotations will hold for a few weeks and that the market will be rather quiet, basing their belief on the large sales made recently. The London market for spot is £31 15s. The exports of September were large, amounting to 8857 tons.

Spelter.—Prices have advanced on comparatively small buying. Prompt prime Western was quoted yesterday around 9.70c., New York, and 9.50c., St. Louis, last quarter at 9.25c. to 9.37½c., St. Louis, and first quarter at 9c. to 9.12½c., St. Louis. Representatives of producers are optimistic and believe that the market will continue strong although no radical advances are expected. While the market has been rather quiet something has been done every day, some of the buying having been on the part of galvanizers. The greatest sustaining influence at present is the expectation that the entente allies will sooner or later buy heavily in connection with their recent large copper purchase. The London market for spot yesterday was £52. The exports in September were exceptionally large, amounting to 14,309 tons.

Antimony.—The market is quiet and unchanged, with dealers quoting Oriental grades at 10c. to 10.25c., duty paid.

Aluminum.—This metal continues strong at 62c. to 63c. per lb. for No. 1 virgin aluminum, 98 to 99 per cent pure.

Old Metals.—The tendency is still upward. Dealers' selling prices are as follows:

	Cents per lb.
Copper, heavy and crucible	26.50 to 27.00
Copper, heavy and wire	25.00 to 26.00
Copper, light and bottoms	22.00 to 23.00
Brass, heavy	14.50 to 15.25
Brass, light	11.75 to 12.25
Heavy machine composition	20.50 to 21.50
No. 1 yellow rod brass turnings	14.75 to 15.50
No. 1 red brass or composition turnings	16.00 to 17.00
Lead, heavy	6.50
Lead, tea	6.00
Zinc	7.00 to 7.50

Chicago

OCT. 2.—The very heavy buying of metals has supported with great firmness even the existing high level of prices. Though some concessions are to be had on purchases of lead, tin and spelter in small quantities from second hands, the attitude of producers is decidedly rigid. We quote: Casting copper, 26.50c. to 27c.; Lake copper, 28.50c. to 29c.; tin, carloads, 39.50c., and small lots, 41c.; lead, 6.90c. to 6.95c.; spelter, 9.25c.; sheet zinc, 15c.; Cookson's antimony, 50c.; other grades, 13c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 22c.; copper bottoms, 20c.; copper clips, 21c.; red brass, 18.50c.; yellow brass, 14c.; lead pipe, 5.50c.; zinc, 6c.; pewter, No. 1, 25c.; tinfoil, 27c.; block tin pipe, 32c.

St. Louis

OCT. 2.—Non-ferrous metals have been quiet, with practically no feature to the trading. Lead is quotable at 6.85c. to 6.95c., according to delivery; spelter, 9.25c.; tin, 41c. to 41½c.; Lake copper, 29c., nominal; electrolytic copper, 28.75c. to 29c.; antimony, 16c. for Asiatic. In the Joplin ore district zinc blende ranged from $45 to $65 per ton, with the average for the week about $57. Calamine ranged from $30 to $40, with the average about $36. Lead ore was firm at $75. On miscellaneous scrap metals we quote dealers' buying prices as follows: Light brass, 9c.; heavy yellow brass, 12c.; heavy red brass, 17c.; heavy copper and copper wire, 19c.; zinc, 6c.; lead, 5c.; pewter, 25c.; tinfoil, 31c.; tea lead, 3.50c.

Frank B. Gilbreth, consulting engineer, Providence, R. I., is to give an address on motion study before a meeting in Buffalo, N. Y., on Nov. 1, of members of the American Society of Mechanical Engineers. C. H. Bierbaum of the Bierbaum-Dollar Company and vice-president of the Lumen Bearing Company, at a meeting on Nov. 29 is to tell of his research work in graphite.

AUGUST EXPORTS AND IMPORTS

Another Record Made for Exports of Iron, Steel and Machinery

WASHINGTON, D. C., Oct. 3, 1916.—The suggestion made in this correspondence in connection with the statistics of iron and steel exports for July, which showed a downward tendency, that it would be well to wait a month or two before deciding that the high-water mark of the big war boom had been reached, is fully justified by the astonishing figures for the month of August, which have just been compiled by the Bureau of Foreign and Domestic Commerce. Another big forward stride is recorded in total exports by values, in shipments of tonnage commodities and in machinery, the figures showing not only substantial gains over June and July but surpassing by a handsome margin the unprecedented totals reached last May.

The value of all shipments of iron and steel products in August was $86,296,703, as compared with $37,726,822 for the same month of 1915; while for the eight months the total was $528,958,703, as compared with $212,697,467 for the same period of 1915.

The exports of iron and steel for which quantities are given aggregated 598,192 gross tons in August, 1916, as compared with 401,298 tons for the same month of 1915. The record for such exports was made in May of this year with a total of 540,591 tons. The total for the eight months ended August was 3,714,426 gross tons, as compared with 2,077,783 tons for the same period of 1915.

The following table shows the exports of tonnage iron and steel for August and for the eight months ended August, 1916, as compared with 1915:

Exports of Iron and Steel

	August		Eight Months	
	1915 Gross Tons	1916 Gross Tons	1915 Gross Tons	1916 Gross Tons
Pig iron	18,567	60,264	127,607	283,382
Scrap	8,818	18,149	30,093	121,833
Bar iron	4,005	5,207	20,043	52,245
Wire rods	13,000	11,451	104,072	107,584
Steel bars	42,327	79,338	261,698	524,584
Billets, ingots and blooms, n.e.s.	89,134	160,921	353,119	888,565
Bolts and nuts	2,767	2,653	12,887	19,351
Hoops and bands	3,675	3,649	15,888	29,590
Horseshoes	3,109	372	13,302	6,206
Cut nails	220	278	2,485	2,795
Railroad spikes	596	1,366	4,238	18,561
Wire nails	11,272	14,809	56,876	99,341
All other nails, including tacks	754	1,160	5,196	6,078
Cast-iron pipes and fittings	2,606	6,348	30,450	42,373
Wrought pipes and fittings	11,152	22,454	83,615	93,514
Radiators and cast-iron boilers	137	434	1,323	1,632
Steel rails	52,040	41,820	178,434	304,773
Galvanized iron sheets and plates	9,263	8,527	57,796	55,123
All other iron sheets and plates	1,983	4,909	11,577	31,436
Steel plates	30,460	26,297	138,760	172,109
Steel sheets	5,422	8,536	62,788	68,110
Structural iron and steel	22,843	27,581	139,191	182,533
Tin and terne plates	21,939	18,758	82,794	160,357
Barb wire	20,596	46,843	140,147	299,515
All other wire	24,613	26,068	146,404	188,203
Total	401,298	598,192	2,077,783	3,714,426

Exports of machinery in August, 1916, were valued at $24,657,597 as compared with $11,439,291 for the same month of 1915. Shipments of metal-working machinery aggregated $8,134,473 in August as compared with $3,624,411 for the same month a year ago and $9,935,806 the high record of May of the present year. Exports of machinery of all kinds for the eight months ended August, 1916, were valued at $148,061,832, as against $79,396,113 for the corresponding period of 1915.

Imports of tonnage iron and steel in August, 1916, amounted to 32,258 gross tons, as compared with 27,560 tons in the same month of 1915. These imports have risen steadily of late, but are still below the record for the current calendar year. Imports for the eight months ended August, 1916, were 177,466 gross tons, against 152,183 tons for the same period of 1915.

The following table shows the imports of tonnage commodities for August and for the eight months ended August, 1916, as compared with 1915:

Imports of Iron and Steel

	August		Eight Months	
	1915 Gross Tons	1916 Gross Tons	1915 Gross Tons	1916 Gross Tons
Ferromanganese	....*	8,525	....*	48,687
Ferrosilicon	86	479	3,632	4,521
All other pig iron	10,819	5,882	51,844	28,857
Scrap	3,795	7,143	20,689	41,432
Bar iron	560	952	5,782	5,792
Structural iron and steel	127	55	1,153	1,067
Steel billets without alloys	81	105	1,116	8,135
All other steel billets	788	1,411	7,292	10,418
Steel rails	10,801	7,056	54,373	23,576
Sheets and plates	165	122	857	1,217
Tin and terne plates	50	105	2,189	775
Wire rods	288	423	3,256	2,989
Total	27,560	32,258	152,183	177,466

*Not separately reported.

Preliminary reports from the leading ports indicate that the export movement was well sustained throughout September, but as there were only 24 official working days in the month it remains to be seen whether the August figures will be equaled or exceeded.

W. L. C.

Pittsburgh and Nearby Districts

More than 75,000 invitations to visit Pittsburgh on Nov. 1, 2 and 3 will be sent by its manufacturers, jobbers and wholesalers to merchants and business men within 150 miles of the city in initiating Pittsburgh's eleventh inbound excursion. As a result of the activity of the trade extension committee of the Chamber of Commerce, many of the leading business men in the cities and towns in western Pennsylvania, eastern Ohio and West Virginia are expected to visit Pittsburgh during the celebration of the charter centennial to be held on the above dates.

The board of directors of the Westinghouse Electric & Mfg. Company has authorized the issuance of a call for the redemption on Jan. 1, 1917, at 105 and interest, of all the outstanding convertible sinking fund 5 per cent bonds of the 1915 issue.

Business men of New Brighton, Pa., will organize a commercial body on the plans of the Pittsburgh Chamber of Commerce. It will take an active part in the discussion of current issues and will do what it can in the way of upbuilding business institutions already in New Brighton and inducing other manufacturing concerns to locate there.

The Driggs-Seabury Ordnance Company, Sharon, Pa., has secured an additional order for 50,000 shells for the Allies. Work will be started on it as soon as material is received. The order amounts to $750,000. The company now has enough work booked to run for a year or more.

Reports that the Crucible Steel Company of America, Pittsburgh, has received orders for 40,000 6-in. and 19,000 12-in. howitzers for the Allies are officially denied. The company has been negotiating with a New York house to supply the steel for some 12-in. shells, but the negotiations have not been concluded.

The annual meeting of the West Virginia Manufacturers' Association will be held in Charleston, W. Va., Nov. 17 and 18. Judge E. H. Gary, chairman of the United States Steel Corporation, and E. A. Hurley, chairman of the Federal Trade Commission, are expected to be among the speakers.

The Sharpsville Boiler Works Company, Sharpsville, Pa., is in the market for a 10-ton electric crane to be installed in an addition it is making to its plant. This addition will be 50 x 150 ft., constructed of steel, for which the Independent Bridge Company, Pittsburgh, has the contract.

The Fuller Engineering Company and the Lehigh Carwheel & Axle Works, both at Catasauqua, Pa., have opened offices in room 706 Farmers Bank Building, Pittsburgh, with J. H. Schuler in charge.

The Matthews Gravity Carrier Company, Ellwood City, Pa., is erecting a new building to facilitate assembling and shipping materials; a new storage house, 80 x 80 ft., for raw and finished materials, and a new forge shop, 40 x 60 ft. The equipment in the present

forge shop will be moved into the new shop, which will also contain the case-hardening furnaces, two more having been furnished by the Flexible Shafting Company, Chicago. The company has recently purchased considerable new equipment, including blacksmith forges, bending rolls, two automatic screw machines from the National-Acme Mfg. Company, Cleveland, Ohio, four drawing presses from the E. W. Bliss Company, Brooklyn, N. Y., three from the American Can Company, Chicago, and two from the Progressive Machine Company, Minneapolis, Minn., a 24-in. milling machine, a grinding machine and automatic feed tables for punching machines and presses.

M. B. Kelley, president American Steel Company, Pittsburgh, has acquired the plant of the Osterberg Tin Plate Company, Waynesburg, Pa., which has been idle for several years. Ownership in the plant for some time has been vested in J. W. Closser, who owned three-fifths interest, and M. B. Kelley, who owned two-fifths. Mr. Kelley has bought Mr. Closser's interest. The plant contains four hot tin mills, three cold mills and six tinning stacks. Mr. Kelley expects to put it in operation as soon as an organization can be formed and minor repairs made.

The American Steel Company, Park Building, Pittsburgh, which operates a wire and wire-nail plant at Ellwood City, Pa., is adding a flat wire and a cold-rolled strip department and will then turn out flat wire up to 1 in. in width and cold-rolled strips up to 10 in. in width. A wire drawing department is also being added for drawing round, oval, square and cotter pin wire.

The W. P. Hannon Company, Youngstown, has received a contract for the structural steel and fireproofing material, foundations and walls for soaking pit furnaces in the new open-hearth steel plant being built by the Mark Mfg. Company at Indiana Harbor, Ind.

The monthly meeting of the Metallurgical Section of the Engineers' Society of Western Pennsylvania was held in its rooms in the Oliver Building, Pittsburgh, on the evening of Sept. 26. Patrick Mullen, mine inspector of the H. C. Frick Coke Company, with headquarters at Scottdale, Pa., talked about "New Mining Methods as Practised by the H. C. Frick Coke Company."

The Semet-Solvay Company, Syracuse, N. Y., has received a contract for the building of 100 Semet-Solvay by-product coke ovens at Portsmouth, Ohio, where the Whitaker-Glessner Company, Wheeling, W. Va., will build a blast furnace to supply pig iron for its open-hearth steel plant at Portsmouth. The ownership of these ovens will be vested in a holding company, in which the Semet-Solvay Company will own one-third of the stock; the Whitaker-Glessner Company, one-third, and the Columbus Iron & Steel Company, Columbus, Ohio, one-third. The plant will make about 1400 tons of coke per day which will be used in the new furnace of the Whitaker-Glessner Company and in the two present furnaces of the Columbus Iron & Steel Company at Columbus, Ohio.

New Strip Steel Plant in Massillon

A new plant will be established in Massillon, Ohio, by the National Pressed Steel Company, to manufacture hot and cold rolled strip steel and metal lumber. The company is allied with the Massillon Rolling Mill Company and the Central Steel Company, Massillon, and R. E. Bebb, president of those companies, has been elected its president. The other officers are: Harry M. Naugle, first vice-president and general manager; F. J. Griffith, second vice-president; A. J. Townsend, third vice-president, and K. R. Jenson, secretary and treasurer. Mr. Griffiths is with the Central Steel Company and Messrs. Naugle, Townsend and Jenson have been connected with the Berger Mfg. Company, Canton, Ohio. The company will shortly begin the erection of a new building for a strip mill on a site adjoining the plants of the Massillon Rolling Mill Company and Central Steel Company, and will remodel another building on this site. It is the intention to provide a plant with an annual capacity of 40,000 tons of strip steel. It is planned to have it in operation next spring.

STRIKES AND SETTLEMENTS

Milwaukee Striking Machinists Return to Open Shops

Practically every union machinist who joined in the organized demand for an 8-hr. day when the strike was declared in the Milwaukee district July 18, had returned to work up to Saturday, Sept. 30. While the percentage of returned men is not yet 100, this is due to the fact that some of the strikers accepted positions in other cities. The strike leaders now claim that the employers have been forced to make the concession of a 52½-hr. working week. As is generally known, every employer of consequence in the Milwaukee district on July 1 voluntarily instituted a 52½-hr. weekly working schedule in place of the former 55-hr. week, and it is on this basis that the men have been taken back. At the same time the Metal Trades and Founders' Association promised to further reduce the working schedule when economic conditions should make this possible. It is significant that all employers treated with the men solely as individuals and, whenever efforts were made to confer as organized bodies, the employers declined to enter into negotiations. Thus the conclusion of the strike appears to be a complete victory for the employers, as the movement for an 8-hr. day has made no headway, the unions have received no recognition, and the open shop principle has not been prejudiced in any manner. The employers are still operating their works without being obliged to consult with or take orders from the unions.

General Electric Strike at Pittsfield Continues

Efforts to bring about a settlement of the strike at the Pittsfield, Mass., plant of the General Electric Company have been futile. A proposal was made by the company which incorporated its previous offer to advance wages 5 per cent Oct. 1; to permit the employees by Australian ballot to determine whether the working hours shall be 50 or 52½ hr. per week; and to make adjustments in pay, following the return of the employees to work, which may be necessary to bring the present rates of pay up to fair market rates. This offer was rejected by the striking employees, and the State board of conciliation and arbitration has resumed hearings in an effort to bring about a settlement. There has been a steady increase in the number of men at work, and practically half of the former number of employees are reported to be on the present payroll. There has been a decided gain in the foundry force.

The Eagle Lock Company, Terryville, Conn., posted a notice that wages would be advanced 10 per cent commencing Oct. 2. About 1400 employees are affected. The company gave a similar 10 per cent raise in October, 1915.

Following a walkout of the molders at the plant of the Wildman Mfg. Company, Norristown, Pa., manufacturer of knitting machines, the company posted a notice announcing that hereafter its employees would be asked to work only 48 hr. a week instead of 54 hr., as heretofore, at the same wages.

Tin now ranks first among Bolivia's mineral exports, having displaced silver in 1915. The exports of tin last year were 36,492 tons, valued at $16,300,000, copper exports ranking second at 23,812 tons, valued at $5,200,000. Antimony exports in 1915 were 17,923 tons, valued at $5,000,000, against only 186 tons in 1914 and 62 tons in 1913. Exports of tungsten were 792 tons last year, with a valuation of $2,000,000, compared with 276 tons in 1914 and 474 tons in 1912.

A meeting of the National Association of Sheet and Tin Plate Manufacturers was held in the William Penn Hotel, Pittsburgh, on Tuesday, Sept. 26. Only routine business was transacted. It is said this association has about ready for adoption a standard form of contract for the sale of sheets and tin plate, and which will be submitted to the members at an early date for their approval.

Machinery Markets and News of the Works

LEHIGH VALLEY INQUIRING

General Electric Issues Another List

Allis-Chalmers Mfg. Company Finishes Shell Contract and Will Concentrate on Regular Output—Skilled Mechanics Scarce

General conditions show but little or no change. Orders continue to accumulate with the makers of standard machine tools, and some of them see deliveries being thrust further forward, despite the pressure under which they are working and the extent to which they have enlarged their facilities.

The Lehigh Valley Railroad is making inquiry in the New York market for a large list of tools, but orders may not be placed in the near future. The General Electric Company has issued a list, including nine boring mills. The company has been a large buyer in recent months.

In Cleveland manufacturers who have finished munitions contracts are offering round lots of second-hand tools, and deliveries of heavy-duty machines are easier, but the general demand is active, with buyers showing a disposition to place orders despite the long deliveries.

Steel mills continue to buy extensively in Cincinnati. In that city railroad buying is spasmodic, and the scarcity of raw materials is becoming acute.

An interesting item from Milwaukee is that the Allis-Chalmers Mfg. Company has completed its shell contract, and is rearranging its equipment for its regular output. The orders it has in hand will require all the employees who have been on munitions work. More mechanics are needed in Milwaukee, although the collapse of the machinists' strike has relieved the situation.

Renewal of operations in the small arms plant of the Rock Island Arsenal, Rock Island, Ill., will require an expenditure of $1,250,000.

Detroit needs 20,000 additional workmen, but is confronted by the lack of sufficient homes.

Texas reports that exports of machinery to Mexico show a decided increase.

Shipbuilding continues the feature in the Pacific Northwest.

New York

NEW YORK, Oct. 4, 1916.

At least two excellent lists of miscellaneous tools are before the trade, while general inquiries for one or two machines continue numerous. Some of the latter are slow in closing.

The Lehigh Valley Railroad is taking bids on an extensive list of shop equipment, but there is no certainty as to when orders will be placed.

The General Electric Company is again in the market, its latest inquiry calling for nine boring mills and a number of other tools. Its boring mill requirements consist of two 42-in., three 34-in., one 72-in., two 52-in. and one 36-in. machines.

The Hurlburt Motor Truck Company, Third Avenue and Harlem River, New York, is in the market for several machines, including turret lathes. Like most motor truck makers, the company is very busy.

The manufacturers of ball bearings have been extensive purchasers in recent months, and will be accepting deliveries for some time. Shipments of standard machine tools are far behind, and the makers' unfilled orders are as great as ever.

The banking houses of Merrill, Lynch & Co., 7 Wall Street, New York, and Cassatt & Co., of Philadelphia, have bought the business of the Spicer Mfg. Company, Plainfield, N. J., which manufactures universal joints for over 45 different automobiles and 62 different commercial trucks, and is one of the largest producers of these parts in the country. A new company has been formed with the same name and incorporated with a capital stock of $5,000,000. The business has been steadily increasing its output from about 140,000 universal joints in 1912 to an estimated output of 500,000 in 1916. Additional plant facilities have already been provided and machinery is being installed to increase the production to about 700,000 joints in 1917. The present equipment includes a power plant of 1000 kw. and a drop-forging plant with an output of 3,120,000 forgings per year. A working force of about 1000 men is maintained. C. A. Dana will continue as president of the new corporation.

The Diehl Mfg. Company, Elizabeth, N. J., manufacturer of electrical equipment, has taken out a permit for a plating, polishing and lacquering building, 80 x 120 ft., one story, to cost about $6,000.

It is reported that the Samuel L. Moore & Sons Corporation, Elizabeth, N. J., will file plans shortly for the construction of its proposed power house.

The Port Henry Light, Heat & Power Company, Port Henry, N. Y., has been sold to new financial interests, who have increased the capital stock from $50,000 to $100,000 and have recently completed a new power house, adding about 1220 kw. to its capacity. George H. Barwise is secretary.

The McNeil Iron Works, Pioneer Street, Brooklyn, N. Y., has let contract for the erection of a one-story addition, 90 x 175 ft.

The Secretary of State of New York, Albany, has recently announced the following increases in capital stock: The Ridden Motor Truck Company, 16 West Sixty-first Street, New York, $10,000 to $500,000; the Hydraulic Race Company, Lockport, N. Y., $100,000 to $400,000; the Pope Cut Glass Company, 170 Broadway, New York, $50,000 to $100,000, and the International Belt Company, 476 Broadway, New York, $125,000 to $135,000.

The Chemical Pump & Valve Company, Perth Amboy, N. J., has let contract for the erection of a two-story plant, 70 ft. square.

The commanding officer of the Watervliet Arsenal, Watervliet, N. Y., has called for bids for the following work at that post: Rebuilding central section of large gun shop; extension of south end and west side of large gun shop; furnishing and installing monorail trolleys for gun lathes; alterations of brick pillars of south wing of large gun shop; extension of smith shop; erection of lumber-storage shed; improvement of shrinkage pit; erection of toilet buildings, locker and recreation rooms.

The Zahn Mfg. Company, Buffalo, Chas. A. Nagel, manager, manufacturer of brewery supplies and machinery, has purchased a three-story brick factory at 74 East Jewett Avenue to provide additional manufacturing facilities.

The Harvey Top & Body Company, Buffalo, has been incorporated with a capital stock of $20,000 and will establish a plant for the manufacture of autos, auto tops, bodies, etc. Lambert G. Smith, Farnham, N. Y.; Henry C. Harvey and Harvey B. Harrison, 614 Morgan Building, Buffalo, are the incorporators.

The W. C. Davies Paper Box Company, Buffalo, has leased factory space at Wells and Seneca streets for use in manufacturing paper boxes, cartons and containers.

The Becker-Hertzog Motor Company, Buffalo, has been incorporated by Frederick and Anna E. Becker and Albert Zog, Buffalo, to manufacture autos, motor trucks, etc. The capital stock is $25,000.

The Newton Arms Company, Buffalo, has purchased a three-story brick factory at East Jewett Avenue, 60 x 140 ft., and is equipping it for the manufacture of small calibre sporting rifles under patents of Charles Newton, 506 Mutual Life Building, president of the company.

Manycraft, Inc., Buffalo, N. Y., has been organized with a capital stock of $15,000 to manufacture toys and art novelties. Gustav Wang, Arthur D. Colburn, Buffalo, and Aaron R. Merritt, East Aurora, N. Y., are the incorporators.

The Sterling Engine Company, Buffalo, manufacturer of motors for motor boats and aeroplanes, is building an extensive addition to its plant at Niagara Street and Auburn Avenue.

The Heinrich Indirect Heat Oven Company, 60 Franklin Avenue, Brooklyn, is having plans prepared by Francisco & Jacobus, consulting engineers, 200 Fifth Avenue, New York, for a four-story factory, 143 x 217 ft., to cost about $100,000.

The Auto Supply & Equipment Company, 587 Jackson Avenue, Long Island City, N. Y., has had plans prepared for a five-story factory, 50 x 110 ft., to cost about $50,000.

The Contact Process Company, Abbott Road, Buffalo, N. Y., has had plans completed for two one-story factory buildings, 26 x 30 ft., to cost about $5,000, and 16 x 40 ft., to cost about $4,500.

The Perth Amboy Chemical Company, Matawan, N. J., will start the construction of an addition to its plant, one story, 40 x 100 ft., to cost about $4,000.

Frank Van Roden, Rutherford, N. J., will erect a two-story machine shop and garage, 50 x 146 ft., to cost about $10,000.

Swift & Co., 154 Ninth Street, Jersey City, N. J., have awarded contract to Egan & Montague, 1 Montgomery Street, Jersey City, for the construction of a one-story boiler room addition, 36 x 59 ft., to cost about $3,000.

J. H. Lehman, Newark, will build a two-story garage and machine shop at 295 Badger Avenue to cost $10,000.

The New York & New Jersey Express Company, 309 Broadway, New York, recently organized, is planning for the erection of a cold storage plant on Front Street, Newark. G. H. Ludlum, president of the Federal Motor Truck Company, Newark, is also president of this company.

Frank Wiegand & Co., Newark, will build a two-story brick plant, 26 x 140 ft., at 1082 Springfield Avenue, for the manufacture of jewelry at an estimated cost of $15,000.

The C. R. Williams Toy Company, 810 Orange Street, Newark, has been incorporated with a capital of $25,000 to manufacture toys. C. R. Williams, A. M. Brooks, and Philip C. Brooks, Newark, are the incorporators.

The C. A. Woolsey Paint & Color Company, Jersey City, will build a two-story and basement concrete addition on Colden Street, to cost $20,300.

The Pennsylvania Railroad has awarded a contract to Henry M. Doremus & Co. for reconstruction work at its tool and vise shops at Meadow Yards, Kearny, N. J.

The Electrical Alloy Company, Morristown, N. J., will build a plant about 100 x 160 ft., on Ridgedale Avenue, for the manufacture of wires and high resistance specialties.

The Standard Aero Corporation, Plainfield, is considering the erection of a new plant at Newark or vicinity, and the removal of its present factory to such site. Daniel L. Meeman, Jr., is treasurer.

The Niles-Bement-Pond Company, 111 Broadway, New York, manufacturer of machine tools, will build an addition to the foundry at its Bement Works, on Donath Street, Philadelphia.

The Princeton Ice Company, Princeton, is planning for the erection of a 20-ton ice manufacturing plant on Spring Street. James Margerum is president.

The Westinghouse Lamp Company, Bloomfield, will build a brick addition to its plant on Clearfield Avenue, Watsessing.

The Kent Motors Corporation, 1790 Broadway, New York, recently incorporated, has acquired a tract of land near Hillside Park, Washington Avenue, Belleville, and plans the erection of a plant with a total area of about 120,000 sq. ft., for the manufacture of automobile parts. The plant will comprise one-story structures of reinforced concrete, including a power plant and an administration building. Marvin & Davis, 303 Fifth Avenue, New York, are the architects. Frederick H. Clarke is president.

The Manhattan Rubber Mfg. Company, Passaic, N. J., manufacturer of mechanical rubber goods, has increased its capital from $1,000,000 to $2,000,000.

The Chevrolet Motor Company, Flint, Mich., has acquired property on Monmouth Street, Hightstown, N. J., and will build a plant for assembling work for all cars sold throughout this section, including Trenton and vicinity.

Catalogs Wanted

The Moore Steam Turbine Corporation, Wellsville, N. Y., manufacturer of single and multi-stage steam turbines, desires catalogs of factory equipment and supplies.

Philadelphia

PHILADELPHIA, PA., Oct. 2, 1916.

Manufacturers at Wilmington, Del., are complaining of a scarcity of workmen. The American Car & Foundry Company reports a lack of ship carpenters to work on wooden ships. Its contracts for such boats now aggregate 20,000 tons. It is reported that the company expects to receive a number of additional contracts.

The Wilmington Steel Company is erecting several buildings, and both the Pusey & Jones Company and the steel company have advertised for men in other cities. The Riverside plant of the Bethlehem Steel Company, where projectiles were loaded, has closed for a time, but as soon as arrangements can be made it will reopen and will employ nearly double its former force.

At the plant of the Sharpless Separator Company, West Chester, Pa., some of its workmen who left to work in the factory of the Remington Arms Company at Eddystone are reported to have returned, and additional workmen have been given employment in the several departments.

Because of increasing business the American Bronze Company, Berwyn, Pa., has erected a building 50 x 60 ft., of steel and concrete, in which it will install melting furnaces, and at least six new melting pots. With this improvement much-needed floor space will be available in the foundry.

Walker & Davis, Inc., machinists, 2765 Kensington Avenue, Philadelphia, have awarded contract to Fred A. Havens & Co., 845 North Nineteenth Street, Philadelphia, for a one-story factory building to cost about $10,000.

The Bement-Miles Works of the Niles-Bement-Pond Company, Twenty-first and Callowhill streets, Philadelphia, has awarded contract to Fred A. Havens & Co., 845 North Nineteenth Street, Philadelphia, for the construction of a one-story addition to its foundry, 24 x 79 ft., and 21 x 32 ft., at a cost of about $5,000.

L. B. Botfield, 624 South Front Street, Philadelphia, is taking estimates on the construction of a two-story factory for the manufacture of fire brick, 28 x 100 ft., to cost about $10,000.

James J. Allen, 621 Gale Building, Philadelphia, has had plans drawn for a brick manufacturing plant estimated to cost about $25,000.

It is reported that the American Manganese Mfg. Company, Bullitt Building, Philadelphia, has purchased the foundry of the Best Foundry Company at New Kensington, Pa., which operated a gray-iron jobbing foundry of about 20 tons a day capacity.

J. B. Millard & Son, Annville, Pa., are reported to be taking bids on several pumps of 5000-gal. per min. capacity and for other machinery for its stone quarries nearby.

The O. M. Weber Company, maker of mill work, cabinet work, flooring, etc., North Wales, Pa., is in need of new or nearly new wood-working machines, as follows: One multiple wood boring machine; one 16-in. hand planer, or hand jointer; one combination sash and door sticker; one double spindle upright molder or shaper; one emery wheel stand complete; one double-wheel emery grinding wheel complete; one belt sander; wood bending equipment, complete; glue jointer; one multiple molding machine.

New England

BOSTON, MASS., Oct. 2, 1916.

The New York, New Haven & Hartford Railroad has been allowed by the Interstate Commerce Commission to continue its extra $5 a day demurrage charge for two months more. This tariff has been hard on many consignees and shippers, but is believed to have been an effective measure in overcoming the delays in loading and unloading cars. The general embargo has not been found necessary lately, but frequently lists are published which put temporary embargoes upon certain manufacturers who have been delinquent in handling shipments.

The New Departure Mfg. Company, Bristol, Conn., through its engineers, Lockwood, Green & Co., Boston, is asking bids on a factory building, 102 x 352 ft., three stories, and a crane shed and bridge, 80 x 228 ft., one story.

The plant at Amston, Conn., which is to be occupied by the Sterling Automobile Mfg. Company, now located in Paterson, N. J., is being rushed to completion.

The Blakeslee Forging Company, Plantsville, Conn., is installing new machinery in its new addition.

The American Brass Company, Waterbury, Conn., has secured a permit to erect a three-story factory, 50 x 210 ft., with an ell, 18 x 21 ft., on South Main Street.

The Simplex Time Recorder Company, Gardner, Mass.,

has had plans prepared for a three-story factory which will more than double its present floor space.

The Chase Metal Works, Waterbury, Conn., has secured a permit for an addition, 61 x 140 ft., one story, on Thomaston Avenue.

The R. N. Bassett Company, Derby, Conn., has bought the three-story factory at Benedict and West Clay streets, and will manufacture steel frames, locks, hinges and other accessories used in making suit cases. It is expected that over 300 workers will be employed. The company now carries on a large business in the manufacture of corset materials.

Pittsburgh

PITTSBURGH, PA., Oct. 3, 1916.

In the surrounding territory advices are that the new demand for heavy machine tools of all kinds is still very active. The best deliveries promised by the makers run from 8 to 10 months on machine tools, and on motors from 7 to 8 months. The new demand for cranes is also very active, and deliveries run all the way from 8 to 10 months or longer. Inquiry is only fairly active for small machine tools, and on account of the high prices and the long deliveries ahead, many intending buyers of small machine tools are picking up second-hand tools wherever they can be found, in preference to ordering new tools at the high prices and waiting so long for deliveries. A recent inquiry came out from the Westinghouse Machine Company at East Pittsburgh, Pa., for equipment as follows:

One 10-ft. planing machine, 10 ft. high, 26-ft. table, 4 heads
One 14-ft. planing machine, 12 ft. high, 26-ft. table, 4 heads
One 10-ft. vertical boring mill, 7 ft. between table and rail
One 8-ft. vertical mill, 6 ft. between table and rail
Two 6-ft. planing machines, 6 ft. between table and rail, 4 heads
Two 4-ft. planing machines, 4 ft. between table and rail, 4 heads
One 3-ft. planing machine, 3 ft. between table and rail, 3 heads
One 6-ft. vertical milling machine, 4 ft. between table and rail
Two 5-ft. vertical milling machines, 3 ft. 6 in. between table and rail
Two 4-ft. vertical milling machines, 3 ft. between table and rail
Three horizontal milling machines, 6 or 7-in. spindle, 42 in. from table to center of bar
One post boring milling machine, 7-in. spindle.
Two horizontal boring mills, 3 or 4-in. spindle
All of the above machines to be motor-driven on a 220-volt, direct current.
One 1000-ton forging press, sufficient to handle 40-in. ingot
Five 4-ft. plain radial drills
Six 42-in. geared head lathes
One 48-in. geared head lathe
One 84-in. geared head lathe
Two 6-ft. plain radial drills

Chicago

CHICAGO, ILL., Oct. 2, 1916.

Reports from manufacturers of machinery indicate that business is being largely sustained by virtue of sales abroad and that domestic buying in the last few months has fallen short of normal. This applies to manufacturers of mining and excavating machinery in particular. It is also true in lesser degree of builders of plate and structural steel fabricating tools, for which there has been an unusual demand for shipbuilding. In standard lines of machine tools no important changes in market conditions have appeared. New inquiry for lathes is reported and also a large aggregate demand for milling machines and automatics. It is of interest to note that the Allis-Chalmers Mfg. Company, Milwaukee, has announced that it will take on no more shell work after Oct. 1, when its standing contracts were completed. It is stated that the company's orders for such machinery and equipment as it normally manufactures will now fully engage its capacity.

The Willard Storage Battery Company, 2524 South Wabash Avenue, Chicago, is having a two-story factory built, 50 x 170 ft., to cost $30,000.

The Standard Spiral Pipe Works, 4800 South Rockwell Street, Chicago, is in the market for a 300 to 500 ton hydraulic press and the necessary pump and accumulator.

The Burnside Steel Company, 548 Railway Exchange Building, Chicago, has been incorporated with a capital stock of $100,000. A tract of land has been purchased at Ninety-second Street and Kimbark Avenue, upon which a foundry, 80 x 200 ft., an office, 30 x 50 ft., and a pattern storage building, with the necessary material bins, etc., are being erected. A side blow converter will be installed, and it is expected to have the plant producing steel castings on Dec. 1. H. F. Wardwell is president, George L. Pollock, vice-president and treasurer, and C. S. Daniels, secretary.

Raynolds Brothers, 1835 West Twenty-second Street, Chicago, will build a garage, 50 x 125 ft., to cost $15,000, and the Chicago Auto Service Company, 5343 South Ashland Avenue, Chicago, a one-story garage, 50 x 121 ft., to cost $12,000.

The Bosch Magneto Company, 119 East Twenty-fourth Street, Chicago, has awarded contracts for its new service building, 60 x 94 ft., which it is to build at 3737 South Michigan Avenue at a cost of $18,000.

The Metal Specialties Company, 3200 Carroll Avenue, Chicago, is building a four-story light manufacturing building, 100 x 160 ft., estimated to cost $100,000.

The Metropolitan Elevated Railway Company, Chicago, is building a new power plant, the building to cost $12,000.

The Douglas Iron Works, Chicago, has been organized with a capital of $100,000 by Irving Zimmerman, 155 North Clark Street, Isadore Brown and E. Peterson.

M. Briskin, 2137 Fowler Street, Chicago, has taken out a permit covering the erection of a two-story machine shop to cost $15,000.

The Packers' Machinery & Equipment Company, Chicago, has been incorporated with a capital of $10,000 by Eugene R. Cohen, Bessie Swick and James Glassner.

The Rockford Automatic Machine Company, Rockford, Ill., has been organized with a capital of $25,000. The incorporators are L. N. Daniels and Oscar T. Wilson.

The Sheridan Stove Company, Quincy, Ill., has been incorporated with a capital of $25,000 by E. H. Huenefeld, Lawrence D. Smith and W. H. Govert.

The Decatur Malleable Iron Company, Decatur, Ill., has filed notice of an increase in capital stock from $75,000 to $100,000.

The Union Products Company, Rockford, Ill., organized by A. A. Martin, formerly sales manager of the Burd High Compression Ring Company, will manufacture automobile accessories, particularly piston rings.

Plans for the Rock Island Arsenal, Rock Island, Ill., provide for the renewal of operations in the small arms plant and extensions for which an expenditure of $1,250,000 is contemplated.

The Enderes Mfg. Company, Littleport, Iowa, manufacturer of hardware specialties, has completed arrangements whereby its business will be moved to Albert Lea, Minn., where a new plant will be erected.

The Megow Traction Company, St. Paul, Minn., is considering the erection of a tractor plant in that city at a cost of $100,000.

The Electric Steel Company, a proposed corporation, of which G. W. Harrison, 1011 Merchants Bank Building; Max Toltz of the Toltz Engineering Company, and Louis Paper of Paper, Calmenson & Co., all of St. Paul, Minn., are the organizers, is expected to build a large foundry and machine shop for the production of electric steel and the manufacture of munitions.

The Federal Cartridge & Machine Company, Minneapolis, Minn., has been incorporated with a capital of $500,000 by Paul R. Seidel, A. C. Egelston and Z. H. Austin, respectively president, vice-president and secretary-treasurer of the company.

The C. & E. Mfg. Company, Marshalltown, Iowa, manufacturer of automobile parts and hardware specialties, is building a new factory which it expects to occupy about Dec. 1.

The Tom Thumb Tractor, Thirtieth Avenue, Southeast, and Northern Pacific Railway, Minneapolis, Minn., announces that its buildings and grounds are ample to take care of its rapidly expanding business for at least some years to come; but that it is short of machinery. The company expects to be in the market for early spring delivery for engine and turret lathes, vertical turret lathes, both vertical and horizontal boring mills, gear shaping machines, milling machines and grinding machines, case hardening ovens and complete floor equipment for its foundry. George C. Jones is president.

The Minnesota Tire & Rubber Company will be incorporated with a capital stock of $200,000 by Nels L. Werner, Red Wing, Minn.; Harry A. Trenholm, of Minneapolis, and James W. Adams, of Ellsworth, Wis. Headquarters will be at St. Paul, Minn. The plant location has not yet been decided on. The company will manufacture rubber goods generally, specializing in automobile tires. Mr. Werner is purchasing agent and will be pleased to get in touch with manufacturers of rubber reclaiming machinery, such as calenders, etc.

Indianapolis

INDIANAPOLIS, IND., Oct. 2, 1916.

The Metal Auto Parts Company, Indianapolis, will erect a factory at Chase and Henry streets to cost $80,000. The plant will cover four acres. The enameling plant will contain 20 ovens. The company will employ there 300 men. It has been working with 150 in its present establishment. B. E. Thompson is president and G. H. Scott is secretary.

The American Metal Furniture Company, Indianapolis, has been incorporated with $10,000 capital stock. The directors are J. A. Miner, Stanley C. Brooks and Edward J. Bennett.

The Mutual Motors Company, Indianapolis, has increased its capital stock from $1,000,000 to $1,500,000.

The Union Refrigerators Companies, Richmond, Ind., have been incorporated with $500,000 capital stock to manufacture refrigerators. Joseph H., E. W. and Elbert W. Shirk, John W. Parkhurst and Jesse E. Moyer are the directors.

The Permalite Corporation, Indianapolis, has been incorporated with $100,000 capital stock to manufacture batteries and other automobile accessories. The directors are E. C. Bacon, E. B. McNabb and Charles S. Shotwell.

The plant of the Bicknell Light & Power Company, Bicknell, Ind., will be moved to Edwardsport and will be enlarged to supply seven neighboring towns. It has been bought by the Indiana Water & Power Company, of Chicago, Ill.

The George J. Hummel Saddletree Company, Madison, Ind., has been incorporated with $10,000 capital stock to manufacture saddletrees, stirrups, etc. The directors are George J. Hummel, Harrison Hoover and D. H. Leitch.

The Hoosier Machine Company, Lebanon, Ind., has been incorporated with $60,000 capital stock to manufacture machinery. Waldo E. Callane, Martin Odekerk and Meredith E. Callane are the directors.

The Poole Engineering & Machine Company, Baltimore, Md., has obtained a controlling interest in the Motsinger Device & Mfg. Company, Lafayette, Ind. The latter company originally made carburetors and automobile devices, but has been giving its attention the last year or so to munitions. Homer N. Motsinger will be consulting engineer for the Poole Company.

The Kokomo Brass Works, manufacturer of plumbing specialties and automobile accessories, Kokomo, Ind., at the present time intends building only a high-grade iron foundry. John W. Johnson is treasurer and manager.

Milwaukee

MILWAUKEE, WIS., Oct. 2, 1916.

A supreme effort is being made in every division of the metal-working industry to provide facilities for handling the constantly increasing volume of business, which in many cases will take up maximum capacity until well into next year. Manufacturers who have been gradually extending their capacities the last 8 to 10 months find it necessary to continue such work, but on a larger scale, in spite of the increasing cost of materials. The question of getting equipment as needed, notably machine tools, is a perplexing one. Tool builders are so crowded with bookings that orders require from 6 to 8 or 12 months for delivery.

The failure of the machinists' strike, which in the last fortnight has brought practically all of the men back to work, has afforded some relief of the congested condition of tool factories. The foundry labor situation is probably more serious, and this condition contributes to some extent to the unsolved problem of the machine-tool trade, particularly as it affects those shops which are obliged to depend upon outside foundries for considerable casting work.

The Allis-Chalmers Mfg. Company, Milwaukee, completed work on its shrapnel shell work contracts on Saturday night, Sept. 30, and is converting the space thus released into a standard machine shop to accommodate regular machine work from other departments of the mammoth plant. The company accepted contracts in August, 1915, for machine work on war munitions from the Bethlehem Steel Company. It is announced that no further shell work contracts will be accepted because of the large demands upon its facilities from regular sources. None of the machinists engaged in work on shells will be dropped from the payroll, but will be distributed among other departments. Work in hand requires many more men than are available, it is stated. The demand for practically every line of production at the various Allis-Chalmers works is said to be the heaviest in years and will keep the capacity well occupied until late in 1917.

The Thorp Automobile Company, Thorp, Wis., is erecting a new public garage, 48 x 70 ft., which is to contain a complete machine and general repair shop.

The Pearson Engine & Mfg. Company, Boston, Mass., maker of internal combustion engines, capitalized at $300,000, may relocate at Green Bay, Wis. Negotiations are being carried on between the company and the Green Bay business men's club. C. D. Ferguson, president, spent the past week in Green Bay to inspect available facilities.

The Harry Dahl Automobile Company, LaCrosse, Wis., is having plans prepared for a two-story garage and service station, 60 x 145 ft.

The Johnson & Field Mfg. Company, Racine, Wis., manufacturer of fanning mills and farm machinery, has leased space in another factory building to compensate for manufacturing space reduced by fire on Sept. 21, when the two upper floors were wrecked. The damaged plant will be rebuilt.

Chalmers Lane, Stevens Point, Wis., has opened a machine shop at 111 North Third Street.

The Reeseville Auto Supply Company, Reeseville, Wis., will build an addition, 40 x 60 ft., to provide more repair shop room.

The Lakeside Bridge & Steel Company, North Milwaukee, Wis., is building additions which will double the capacity of its fabricating and erecting plant. The work is in charge of the Coddington Engineering Company, North Milwaukee.

The Chicago & North-Western Railroad Company has awarded the contract for the construction of its No. 3 ore dock at Ashland, Wis., to the Grant & Smith Construction Company, St. Paul, Minn. The project will involve $2,000,000.

The Chatfield Brass & Iron Works, Escanaba, Mich., has disposed of its business to Hubert and Frank Schepeck and C. H. Van Donk, who have reorganized under the style of Chatfield Machine & Foundry Company. O. P. Chatfield has been in ill health for some years and will retire. The business was established 15 years ago. Peter Brandenberg is retained as superintendent, and the business will be managed by these officers: President, Hubert H. Schepeck; vice-president, C. H. Van Donk; secretary and treasurer, Frank Schepeck.

Chicago interests are reported to be negotiating for the purchase of the John F. Dornfeld machine shop and foundry at Watertown, Wis. The plant has been operating only part time for several months, following the readjustment of the financial affairs.

A report from Eau Claire, Wis., says that C. M. Conradson, known as a designer of lathes and other machine tools, is organizing a company to manufacture several new types of tools at Chippewa Falls, Wis. Details of the plans are not available.

The Metal Stamping & Mfg. Company, of Milwaukee, has changed its name to the Best Register Company, not the reverse, as was stated in THE IRON AGE of Sept. 7.

The Aluminum Goods Mfg. Company, Manitowoc, Wis., is preparing to build a three-story building, 100 x 250 ft., on the site of the present two-story shop, immediately upon the completion of work on the new five-story factory, storage, office and warehouse building, now under way. The building to be replaced is the original unit of the present plant. Plans for the new structure are being prepared by Earl F. Miller, architect, Manitowoc, and the contract probably will be awarded to Walter Oeflein, Milwaukee.

W. H. Cone, Minneapolis, Minn., has practically decided to locate at Eau Claire, Wis., a factory for the production of motion picture machines adapted principally for educational purposes and now being manufactured under contract in Minneapolis and St. Paul. For the present most of the manufacturing operations on parts would be done by Eau Claire concerns, and assembled in the company's plant, but within a year it is intended to establish a complete manufactory.

The Wisconsin Sugar Company, Milwaukee, is preparing to resume operations in its big sugar mill at Menominee Falls, Wis., and will add considerable new equipment, in addition to completely overhauling the present plant. Kurtis R. Froedtert, Milwaukee, is president and general manager.

Charles Skidd and J. Hepmeyer, Kenosha, Wis., are negotiating for a site at Chippewa Falls, Wis., for the location of a proposed plant for the manufacture of pasteurizing milk coolers. The board of commerce, Chippewa Falls, is expected to furnish a three-acre site and a building costing about $30,000, title to which is to pass to the promoters when wage payments have reached a certain stipulated figure.

Martin Tullgren & Sons, architects, 133 Second Street, Milwaukee, are taking bids for the erection of a garage at Downer Avenue and Webster Place. It will be 110 x 122 ft., two stories and basement, and cost $45,000. The Neacy & Read Investment Company is the owner.

The Cumberland Fruit Package Company, Cumberland, Wis., is doubling the capacity of its works by erecting a two-story addition, 32 x 105 ft., of brick and concrete. Additional machinery will be installed.

The Steam Appliance Company, Milwaukee, awarded the general contract for the erection of its new foundry at Sixty-third Avenue and Burnham Street to the Foster Construction Company, Caswell Block, Milwaukee. The steel work has been sublet to the Northwestern Bridge & Iron Company, Milwaukee.

Bids are being taken until Oct. 5 by the board of education, Escanaba, Mich., for the erection of a manual training addition to the present high school at a cost of $30,000. It will be 47 x 100 ft., three stories and basement. The architects are G. Arnzten & Brother.

Bids are being received until the end of the week for the erection of a $15,000 garage and Ford service station at Fifth and Wells streets, Milwaukee, for the Gilman Estate, to be occupied by the Auto Mart of Milwaukee. It will be of brick and steel, 65 x 135 ft., one story and basement. The work is in charge of Thomas Van Alyea, architect, 420 Jefferson Street.

The Armour Packing Company, Chicago, will erect a new branch house and refrigerator building at Ashland, Wis., and has awarded the contract to Tomlinson & Egan, 322 Second Avenue, Ashland. It will be 60 x 80 ft., two stories and basement, and cost $45,000 with equipment.

Fire in the plant of the Green Bay Foundry & Machine Works, Green Bay, Wis., on Sept. 26 caused a loss of $1,500. Repairs are under way.

Cleveland

CLEVELAND, OHIO, Oct. 2, 1916.

Some round lots of second-hand machinery are being offered by manufacturers who have completed munition contracts and have no further need for special equipment. The gen ral demand from all sources for single machine tools and small lots continues quite active. Most of this is wanted for early delivery, but buyers are taking the best delivery they can secure. Shipments of heavy-duty drilling machines have eased off somewhat. As a whole the delivery situation, however, has not improved although the trade is being better supplied than some time ago through regular shipments on stock orders. The demand for forging machinery continues heavy, with an increase of orders from the railroads. Grinding machines are very scarce for early shipment. Considerable new demand has developed for steam hammers. Some good orders for cranes for steel plants have come out the past few days. It is understood that crane equipment, heavier than ever before built, will be required for handling the larger sizes of guns to be made for the United States Government.

A plant to manufacture cold-drawn steel will be established in Cleveland by the Drawn Steel Company, which has been incorporated with a capital stock of $200,000. J. H. Worbs, formerly connected with the Adams-Bagnall Electric Company, Cleveland, is a stockholder. A building site has not yet been selected.

The Peerless Motor Car Company, Cleveland, has placed contracts for two three-story factory buildings, one 60 x 270 ft. and the other 53 x 160 ft. It has completed plans for a one-story steel-frame building with saw-tooth roof, 120 x 300 ft., all to be used in the manufacture of touring cars.

The Chandler Motor Car Company, Cleveland, will enlarge its plant by the erection of a four-story reinforced concrete building, 60 x 500 ft., to be used for assembling and finishing. Ernest McGeorge, Cleveland, is the architect and engineer.

The Winton Company, Cleveland, is having plans prepared for an addition to its automobile plant to cost $80,000. Contracts will be placed so that the work can be started early in the spring.

The Sheer Brothers Fence & Iron Company, Cleveland, is understood to be looking for a site for a new plant with a view of doubling its capacity.

The Metals Plating Company, Cleveland, has been incorporated with a capital stock of $5000 by Edmond W. Hyde, Ralph W. Edwards and others.

The Ackerman Wheel Company, recently incorporated with a capital stock of $2,500,000 is planning to erect a plant in Cleveland to manufacture wheels for automobiles, motorcycles and aeroplanes. Among the incorporators are W. A. Bennett and Henderson McIntyre, 1108 Engineers Building. The company has taken over the business of the Ideal Wheel Company, Massillon, Ohio.

The Buckeye Engine Company, Salem, Ohio, is planning an enlargement to its plant due to increased business. A portion of the old plant will probably be replaced by a building, definite plans for which have not yet been decided upon. In addition to manufacturing gas engines it is making a complete line of presses for the Cleveland Machine & Mfg. Company, an allied interest.

The Advance Electric Company, Leetonia, Ohio, maker of electric devices, of which A. J. Wayman is president, has arranged to move its plant to East Palestine, Ohio.

The Findlay Steel Castings Company, Findlay, Ohio, recently incorporated, has acquired an option on the building now occupied by the Grant Motor Company.

The American Hard Rubber Company, Akron, Ohio, will erect a new plant consisting of five one-story buildings.

The Acme Steel Company, Akron, Ohio, has been incorporated with a capital stock of $60,000 by E. M. Herrick, C. A. Spencer and others.

The Miller Rubber Company, Akron, Ohio, will build a new eight-story brick and steel factory building.

The Sandusky Foundry & Machine Company, Sandusky, Ohio, has increased its capital stock from $100,000 to $200,000 to take care of the growth in its business.

The plant of the Dover Mfg. Company, Canal Dover, Ohio, manufacturer of gas and electric sadirons, was almost totally destroyed by fire Sept. 26. Plans are under way for rebuilding.

Steiner Brothers, Lima, Ohio, makers of tools and jigs, have about completed plans for a new one-story factory, 40 x 150 ft.

The Massillon Foundry & Machine Company, Massillon, Ohio, is understood to be considering the erection of a new plant, having outgrown its present quarters.

The Akron Mold & Machine Company, Akron, Ohio, has increased its capital stock from $60,000 to $300,000 to take care of the growing business.

The Coffield Tire Protector Company, Dayton, Ohio, has been incorporated with $50,000 capital stock by J. P. Coffield and others. The company will have its device manufactured under contract and will not require any equipment.

The Dayton Steel Wheel Company, Dayton, Ohio, has been incorporated with $50,000 capital stock by George Walther and others. Manufacturing plans have not yet been given out.

Detroit

DETROIT, Mich., Oct. 3, 1916.

The demand for machine tools the past week more than made up for the slight falling off of the previous week. A decrease in foreign inquiries is evident, but manufacturers are using this lull to catch up on orders. The larger tools still require several months for delivery. A demand for 20,000 skilled mechanics exists in Detroit, but the lack of houses continues to drive many away. Similar conditions are reported in the larger cities of the State.

The McCord Mfg. Company, Wyandotte, Mich., is planning a two-story one-block addition, which will double the capacity of its plant. The company has been in operation only six months, at that time taking over the plant of the defunct Tilden Saw Company.

The Fay Foundry Company, St. Joseph, Mich., will at once begin building an addition to its plant which will double the capacity.

The Wizard Auto Parts Mfg. Company, Bay City, Mich. has been organized by F. B. Scheurmann and L. J. Weatherwax to manufacture a steering device.

The Motor Products Corporation, Detroit, has begun operations in the plant recently acquired from the Lozier Motor Company. It is the successor of the Diamond Mfg. Company, Detroit, and Walkerville, Ont.; the Rand Mfg. Company, the Vanguard Mfg. Company, the Universal Metal Company, all of Detroit, and the Superior Mfg. Company, Ann Arbor, Mich. All of the Detroit factories are being combined under one roof. The Ann Arbor factory will be maintained for special work, while the plant at Walkerville will be enlarged to take care of the Canadian trade. Property adjoining the Detroit plant has been secured to allow for additions. The output of the company includes hub caps, radiator parts, tubing and metal shapes, exhaust tubes and other automobile parts. Special die and stamping work is also done. The officers are W. C. Rands, president; C. F. Jensen, vice-president and director of purchases; D. D. Lee, treasurer and general manager; H. H. Seeley, vice-president and sales manager, and M. L. Brown, secretary.

The Chatfield Machine & Foundry Company, Escanaba, Mich., has been incorporated for $25,000, to do general foundry and repair work. The stockholders are Frank G. Shepeck, H. H. Shepeck and C. H. Vandonk, all of Escanaba.

The Lansing Pure Ice Company will spend $20,000 this fall in re-equipping its plant for greater capacity.

The River Raisin Paper Company, Monroe, Mich., has purchased 35 acres of land on the Shore Line Railway at

Monroe. G. H. Wood, general manager, has announced that a factory will be built next spring for the manufacture of paper.

The Baker-Vawter Company, Benton Harbor, Mich., has been incorporated for $1,500,000 to manufacture office systems and supplies. William A. Vawter and W. W. Switzer are stockholders.

The Randolph-Pennington-Davis Machine Company, Detroit, has been incorporated to manufacture machinery. The stockholders include Gordon M. Pennington, 2579 Woodward Avenue, Detroit; Eldon W. Randolph and Edward Davis.

The Atlas Drop Forge Company, Lansing, Mich., has increased its capital stock from $200,000 to $500,000.

The Filer Fiber Company, Manistee, Mich., has been organized with $300,000 to manufacture pulp. The principal stockholder is E. G. Filer. Philip H. Schnorback, formerly of Muskegon, will be manager. Work on the erection of a new plant, to be completed within eight months, will begin at once.

The Columbia Motor Car Company is seeking a factory or factory site in Detroit, according to J. G. Bayerline, 1003 East Grand Boulevard.

The Lansing Stone Block Company, Lansing, Mich., has been incorporated by R. H. Fletcher, Reg William Graham and George M. Tews, all of Bay City, Mich., to manufacture cement blocks.

The Metalwood Mfg. Company, Detroit, manufacturer of high-speed machinery, equipment, valves, fittings, etc., is adding 6000 sq. ft. of floor space to its factory and installing new machinery. William R. Keen, secretary and treasurer, will shortly be made president and general manager.

A. M. Chesbrough, Toledo, Ohio, is planning the erection of a saw mill at Newberry, Mich., next spring, to cost $150,000.

The Grand Rapids Furniture Company, Grand Rapids, Mich., will spend $20,000 on a four-story manufacturing addition to its plant.

Cincinnati

CINCINNATI, OHIO, Oct. 2, 1916.

The rolling mills are buying more machine tools than at any time in the history of the trade. Large-sized lathes are in good demand and a number of inquiries are noted for planing and radial drilling machines. Railroad buying is somewhat spasmodic, and only a few orders have been reported recently. The shortage of finished material is becoming a matter of greater concern to all manufacturers. Cold-rolled shafting is hard to obtain for prompt delivery. Shipments of high-speed steel are easier, but the demand is yet in advance of the supply.

The labor situation is more satisfactory. No trouble is reported from local plants. The strikers at Dayton are gradually returning to work, and the trouble there is expected to end within a few days.

The Star Motor Car Company, Cincinnati, has been incorporated with $200,000 capital stock and will establish a plant for assembling steam-driven automobiles. Among the equipment wanted is one 16-in. lathe, several upright drilling machines and portable electric drilling machines. R. M. Wallingford, 1003 Race Street, is secretary.

The Tower Mfg. Company, Cincinnati, is in the market for tack machines, either new or second-hand, to be installed in its plant on Elm Street.

It is currently reported that the Ohio Mold & Foundry Company, Cincinnati, recently incorporated with $100,000 capital stock, contemplates refitting the foundry of the Lane & Bodley Company, in Bond Hill suburb, to be used for the manufacture of ingot molds. Harry L. Klein, Union Trust Building, Cincinnati is one of the incorporators.

The Central Tool & Die Company, Dayton, Ohio, has been incorporated with $10,000 capital stock by J. R. Baughman, and others. Manufacturing plans have not been given out.

Contract for the superstructure of the new Dayton Power & Light Company's plant, Dayton, Ohio, has been let to the Structural Concrete Company, Dayton. The plant is expected to be ready for the installation of the necessary equipment early next spring.

The Ohio Malleable Iron Company, Columbus, Ohio, a subsidiary of the Jeffrey Mfg. Company, has had plans prepared for an addition to its foundry estimated to cost $70,000.

The Fischer Auto Sales Company, Columbus, Ohio, will erect a two-story sales building at 269 East Broad Street, which will contain an automobile repair shop.

The Miller Improved Gas Engine Company, Springfield, Ohio, has its new founrdy in full operation. No additional equipment will be required just now.

The plant of the Jackson Stone Company, Piqua, Ohio, was completely destroyed by fire last week. It will be rebuilt at an early date.

The Kelly-Springfield Tire Company, Wooster, Ohio, announces that it will build a large addition to its plant.

The American Fork & Hoe Company, Geneva, Ohio, will build a brick addition to its plant, 60 x 400 ft. A forge room, 42 x 110 ft., is also contemplated.

It is reported that the Hirsch Iron & Steel Company, St. Louis, Mo., is making arrangements to locate a branch in Cincinnati for handling scrap iron and second-hand machinery.

Baltimore

BALTIMORE, MD., Oct. 2, 1916.

The Crown Cork & Seal Company, 1511 Guilford Avenue, Baltimore, will have a one-story substation, 40 x 80 ft., built at a cost of about $11,000.

A large acid phosphate plant will be built by the Standard Guano Company, 1500 Continental Building, Baltimore, at its plant at Curtis Bay, Md.

The Blackard Stave & Cooperage Company, Stuart, Va., will build a cooperage plant containing a wood-working shop.

The Baltimore Enamel & Novelty Company, foot of Woodall Street, Baltimore, manufacturer of license tags, etc., will build a plant at Westport, Md.

The Chester Shipbuilding Company, Chester, Pa., has awarded a contract for turbine equipment for 15 vessels to the Westinghouse Machine Company, Pittsburgh, Pa. The contract is understood to amount to almost $1,000,000.

The Central South

LOUISVILLE, KY., Oct. 2, 1916.

An increased number of inquiries for power and ice-manufacturing equipment is reported by local manufacturers as the outstanding feature of the week. Projects for establishment of electric-lighting and power plants in the smaller cities of the section continue to come out. A low stage of the river, precluding shipments of Pittsburgh coal, and continued shortage of cars which is having the effect of driving many coal operators virtually out of the open market on steam coals, are threatening enforced suspensions of numerous industrial plants in this section.

The Louisville Provision Company, Louisville, Ky., has let a contract to the Alt Building Company, Louisville, Ky., for construction of a six-story reinforced concrete addition which will double the capacity of its packing plant. J. M. Emmart is general manager.

Fire destroyed the machine shop and engine room of the McDougall Kitchen Cabinet Company, Frankfort, Ky.

The Russell Brothers Company, Perryville, Ky., plans to build an electric light plant at a cost of $50,000.

The Gus Edwards Motor Company, Paducah, Ky., has been incorporated with capital stock of $5,000. G. W. Katterjohn is president. Gus Edwards, secretary, treasurer and manager.

Robert Crow, Madison, Ky., has let a contract to W. L. Hall for the erection of a garage, 40 x 160 ft.

The Security Producing & Refining Company, Irvine, Ky., is to be incorporated in Delaware with capital stock of $3,700,000 to develop oil lands in Estill County, Ky., build and operate refineries, etc. George B. Williams, Irvine, Ky., is president; W. Hume Logan, Louisville, Ky., vice-president, and John M. Hodkin, Winchester, Ky., secretary. The company has acquired rights on nearly 20,000 acres.

G. O. Tuck & Co., Louisville, Ky., are negotiating with Mt. Sterling, Ky., interests for the erection of a tobacco redrying plant at that point, to cost $30,000, which the Louisville Company would lease. The equipment would include a boiler and engine, and tobacco-handling equipment. J. W. Vaughn is president of G. O. Tuck & Co.

The Price Mfg. Company, Chattanooga, Tenn., has been incorporated with capital stock of $95,000 and will manufacture foundry products. The incorporators are S. S. Price, W. D. Moon, J. S. Price, F. J. Miller and J. H. Cantrell.

The Knoxville Motor Company, Knoxville, Tenn., has been incorporated with $10,000 capital stock by W. T. Rowe, J. E. Dupes, O. A. Kohlhase and others.

The Lockwood Automobile Company, Memphis, Tenn., has been incorporated with $5,000 capital by Robert, Charles and G. C. Lockwood, William O'Halloran and Thomas J. Davis.

A. R. Pryor, Jasper, Tenn., has begun construction of a garage and machine shop, two stories, 50 x 100 ft. W. A. Dunwody, South Pittsburg, Tenn., has the contract.

The water commission, Knoxville, Tenn., has approved the design and specifications for a triple-expansion centrifugal pump of 15,000,000 gal. per day capacity for the municipal water system. H. C. Anderson, Cincinnati, Ohio, consulting engineer, is now preparing revised specifications. The water commission has asked for estimates of the cost of enlarging the present pump house and boiler room, as well as for the construction of new pump house and a filter plant. A $225,000 bond issue is to be voted on by the city Oct. 24.

The Colonial Lumber Company, Bearden, Tenn., is asking for prices on a new or second-hand lighting plant equipment for a small town; second-hand 6 or 7-ft. band sawmill and a new or second-hand engine lathe.

The John G. Duncan Company, Knoxville, Tenn., is in the market for a second-hand, 500-hp. or larger Corliss engine, for quick delivery.

Birmingham

BIRMINGHAM, ALA., Oct. 2, 1916.

Machinery houses report a good volume of business. New construction work is increasing. The graphite mining development in Alabama is constantly calling for apparatus for hydroelectrically operated plants. Activity in the sawmill trade is curtailed somewhat by car shortage.

H. C. Murname, Memphis, Tenn., and associates, contemplate the construction of a shipbuilding plant in Mobile.

The Birmingham Slag Company, Birmingham, which is building a slag-crushing plant with a daily capacity of 3000 to 4000 tons, is nearly ready to purchase machinery. H. G. Ireland is general manager.

The Guin Cooperage Company, Guin, Ala., has been incorporated with a capital stock of $12,000 by J. Miley, Fayette, Ala., and others.

The Clark-Pratt Cotton Mills, Prattville, Ala., will rebuild its hydroelectric dam washed away by floods. An expenditure of $25,000 is involved.

Winchester, Ga., voted $45,000 of bonds for a waterworks and sewerage system.

The Plant City Public Service Company, Plant City, Fla., has acquired the properties of the Plant City Ice & Power Company and proposes to enlarge them. Roscoe Nettles, Plant City, is secretary.

St. Louis

ST. LOUIS, Mo., Oct. 2, 1916.

Business continues good in the machine-tool trade, with all divisions showing a satisfactory volume. While it continues a market of practically single tools the aggregate is keeping up well. On some classes of equipment delivery dates are being anticipated somewhat, indicating that manufacturers are catching up.

The plant of the St. Louis Plate Glass Company, Valley Park, St. Louis, is to be rehabilitated and put in operation.

The Fore Electrical Mfg. Company, St. Louis, has been incorporated with a capital stock of $10,000 by Albert Wehmeier, J. H. McEwen and L. R. Brown to manufacture electrical and mechanical devices.

The Polar Wave Ice Company, St. Louis, will build a branch plant to cost $20,000 exclusive of ice-making equipment.

The Lafayette Motor Car Company, St. Louis, has been incorporated with a capital stock of $15,000 by Milton B. Strauss, W. H. Anderson and Jesse A. Wolfort to equip a machine shop.

The board of public service, St. Louis, has prepared plans for waterworks improvement, including one engine and pump of 100,000,000 gal. per day capacity.

The Motor Repair & Storage Company, Kansas City, Mo., has increased its capital stock by $12,000, and will add new equipment.

The Carthage Foundry & Machine Works, Carthage, Mo., will erect a building to cost about $15,000, and will require some new equipment.

The E. A. Martin Machinery Company, Joplin, Mo., has been incorporated with a capital stock of $10,000 by E. A. and L. M. Martin and Grover C. Jones.

Love & Martin, Joplin, Mo., will erect a garage 70 x 140 ft., which will be equipped with a machine shop.

Trenton, Mo., will receive bids until Oct. 11 for equipment for a filter plant of 1,200,000 gal. capacity, three units; two centrifugal pumps of 1000 gal. per minute; one 60-kw. generator, etc. E. E. Harper, Kansas City, Mo., is engineer.

The McGehee Water and Light District, McGehee, Ark., H. W. Wright superintendent, will install one 175-hp. oil engine, direct connected to one 130-kw. three-phase, 60-cycle, 2300-volt alternating current generator, etc.

Conway, Ark., J. C. Dawson, mayor, will equip a steam pumping station to supplement its electric pumping equipment.

E. L. Bruce & Co., Little Rock, Ark., will rebuild their flooring plant, expending about $100,000 and doubling the former capacity. New wood-working equipment will be needed.

The Prairie Oil & Gas Company, Tulsa, requires heavy pumps for an oil pipe line between Tulsa, Okla., and St. Louis, Mo.

The Ajax Gasoline Company, Nowata, Okla., has been incorporated with a capital stock of $500,000 by J. W. Sanders, Tulsa, Okla.; William H. McCrum and John J. McPherson of Kansas City, Mo., and will equip a refinery.

R. L. Jones, Bristow, Okla., will replace his machine shop and garage recently burned with a loss of $20,000.

Tulsa, Okla., will equip a low-service pumping station at its waterworks plant. Stevens & Stiles, Kansas City, Mo., are the engineers.

About $100,000 is to be expended for the enlargement of the plant of Morris & Co., meat packers, of Chicago, at New Orleans, La.

The Burguires Company, New Iberia, La., will build a sugar refinery to cost about $50,000.

The Jeffery Sales Company of Louisiana, New Orleans, La., has leased a garage and will install about $10,000 worth of equipment.

The Oak Lawn Sugar Company, Franklin, La., is in the market for equipment for an isolated electric plant.

Texas

AUSTIN, TEX., Sept. 30, 1916.

Machinery exports to Mexico show a notable increase the last few weeks. The lines of railroad leading from Rio Grande River points to interior portions of Mexico are now open to regular freight and passenger traffic. The machinery and tool trade in Texas continues to show a steady improvement.

It is stated by Vories P. Brown, San Antonio, president of the San Antonio & Austin Interurban Railway Company, that the financing of that project has been accomplished and that the construction will start soon. An electric power plant is included in the plans.

The Texas Gas Company will install a gas compressing station near Mexia. The Hope Engineering Company, Pittsburgh, Pa., has been awarded the contract.

The Atlantic Electric & Ice Company, Atlanta, Tex., will rebuild its electric light and power plant and ice factory which were recently burned. The cost will be about $40,000.

The Round Bale Gin Company, Seguin, will install machinery to replace that recently damaged by fire.

The Atlantic & Gulf Petroleum Company, Houston, which has a capital stock of $1,500,000, contemplates building an oil refinery upon a tract of land which it owns, fronting the ship channel. R. E. Burt is president.

The Glenn Broom Mfg. Company will install machinery at El Paso for manufacturing brooms. The plant will cost about $10,000.

The Pacific Northwest

PORTLAND, Ore., Sept. 26, 1916.

There seems to be no end to the expansion of shipbuilding facilities. Most of the new projects now being undertaken are for the construction of wooden vessels, practically all to be equipped with steam or Diesel engines, as well as steam, gas or electric subsidiary equipment for handling cargo, etc. Builders of steel vessels also are still adding to their equipment. The completion of vessels now building will give an outlet for a great amount of lumber, for which a strong and increasing foreign demand has been created.

The domestic lumber market is steadily improving, but car shortage has been so serious that some mills have been compelled to close for a time. Mill equipment is rather quiet, but a revival is expected in the spring. Mining, ore-milling and smelter machinery is still an important factor. Preliminary work is being done on several important railway construction jobs in Oregon, and construction of irrigation works is active. Slow delivery of all kinds of manufactured goods from Eastern sources is causing a steady expansion of miscellaneous industries on the Pacific Coast.

involving a demand for power units and specialized machinery for many purposes.

James Feeney, Tillamook, Ore., has organized the Vancouver Ship-building Company, and plans to establish a plant below Vancouver, Wash., for the construction of motorships.

A large part of the steel to be used in building five steamers for Norwegian interests by J. F. Duthie & Co., Seattle, will be fabricated by the Northwest Steel Company, Portland. Ships now under contract in the Portland customs district are valued at over $16,000,000.

J. H. Hansen & Co., San Francisco, agents for Skandia Diesel engines, are having eight 240-hp. engines built in San Francisco shops for vessels now under construction at Astoria, Ore., and Hoquiam, Wash.

The Port of Coos Bay Commission, Marshfield, Ore., is considering plans for the construction of a suction dredge at an estimated cost of $50,000. The Port of Bandon, Ore., is also having plans prepared for a suction dredge for use in Coquille River.

W. L. Corson, chief engineer of the Union Gas Engine Company, San Francisco, has gone East to make arrangements for the construction of Diesel engines under the patents of the James Craig Engine & Machine Works, Jersey City, by the Union Company, which already has the sales agency for these engines.

The Pacific Coast Steamship Company, Seattle and San Francisco, plans the early construction of two 20-knot passenger and freight steamers at a cost of $1,500,000 each. The work on the vessels will be hastened due to recent destruction of its steamship Congress. The boats will be built probably in the Northwest.

The plant of the Everett Box & Mfg. Company, Everett, Wash., was destroyed in a recent fire, with a loss of $30,000. It is understood the plant will be rebuilt.

A shop building of the Empire Copper Company, Mackey, Idaho, was completely destroyed by fire with a loss of about $20,000. It housed the machine shops, sawmill and blacksmith shop. A structure is being built to replace it, and a complete new machine shop will be installed.

Two structures of the International Cement Company's plant at Irvine, Wash., were destroyed by fire with a loss of $100,000. One of the buildings housed the stock of the company. The plant will be rebuilt.

The Dunning & Erich Harvester Company, Harrington, Wash., plans improvements and additions to its plant, to provide for increased business. A structure 50 x 150 ft. will be built this winter.

The Oregon Portland Cement Company, Wilcox Building, Portland, plans improvements to its plant at Oswego, Ore. A river-front dock, conveying system, and a number of barges are included in the program.

The Columbia Engineering Works, Linnton, Ore., will soon lay the keel of the first vessel to be constructed at its new wooden shipbuilding plant. A. M. Mears is superintendent.

Plans for the plant of the Hanover Gypsum Company at Lewistown, Mont., to cost $600,000, are practically completed, and foundation work has been started.

Canada

TORONTO, Oct. 2, 1916.

Fire completely destroyed the machinery and plant of the Percival Plow & Stove Company, Merrickville, Ont., including many patterns.

The utilities board, London, Ont., proposes to purchase motor-driven direct-connected air compressors. E. V. Buchanan is manager.

The McClary Mfg. Company, London, Ont., has let the contract for a galvanizing plant to C. Insell & Sons. The plant will be of brick construction and cost $30,000.

The ratepayers of Dunnville, Ont., passed a by-law to spend $53,000 for an electric light plant. J. W. Holmes is clerk.

The London & Port Stanley Railway, London, Ont., will spend $30,000 in extending its shops and barns.

Tenders are being received for the construction of a machine shop, 50 x 150 ft., of steel and concrete, to be erected at Belleville, Ont., for J. C. Wilson & Co., Glenora, Ont. J. W. Evans, Belleville, is the architect.

E. R. Gray, city engineer, Hamilton, Ont., has been authorized to prepare plans for waterworks buildings and equipment, including a high-duty triple expansion steam unit and steam turbine, to cost $300,000.

Hawkesbury, Ont., is calling for tenders for one electrically driven turbine pump of 1,000,000 gal. per day capacity, direct connected to a 100-hp. motor; one pump of 750,000 gal. per day capacity, with 75-hp. motor, and for one pump of 500,000 gal. per day capacity with 50-hp. motor. M. Gareau is town clerk.

The Superior Barn Equipment Company, Fergus, Ont., is erecting a plant for the manufacture of barn equipment, etc.

The Harriston Casket Company, Harriston, Ont., will erect a plant there to replace one recently destroyed by fire.

All arrangements have been completed whereby the Partridge Rubber Company, Montreal, will take over the plant of the Standard Tire & Rubber Company at Guelph, Ont. The Partridge Company is preparing to install machinery in the Guelph plant now in use in its Montreal plant.

The Brunner-Mond of Canada, Ltd., Toronto, has been incorporated with a capital stock of $3,000,000. It is making preparations for the erection of a plant at Amherstburg, Ont., for the manufacture of alkali products. The Solvay Process Company, Syracuse, N. Y., is interested in the company.

The Frost Wire Fence Company, Sherman Avenue North, Hamilton, Ont., will build an addition to its plant at a cost of $4,000.

The contract has been let by the Dominion Steel Castings, Depew Street, Hamilton, Ont., to Mackay & Paulin, Bank of Hamilton Building, for the erection of a brick factory to cost $75,000.

John Bertram, Sons & Co., Dundas, Ont., are making extensive additions to their plant for the manufacture of machine tools, etc.

The Alton Foundry Company, Ltd., Alton, Ont., is in the market for 3-phase, 60-cycle, 220-volt motors of 5, 10, 20 and 25 hp.

The Russell Motor Car Company, King & Duncan streets, Toronto, has received a permit for the erection of a machine shop at Dufferin and Liberty streets to cost $40,000. T. A. Russell is president.

The Dodge Metal Hose Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of $150,000 by Donald L. McDonald, care of the Trust & Guarantee Company; Eila De G. Gibson, Elsie Granger and others to manufacture rubber and metal hose connections, etc.

The Panther Rubber Company, Ltd., Sherbrooke, Que., has been incorporated with a capital stock of $100,000 by Harry R. Fraser, Frederick S. Rugg, Charles A. Joslin and others to manufacture rubber, hose, etc.

The Manville Asbestos Company, Ltd., Montreal, has been incorporated with a capital stock of $1,000,000 by Gordon W. Macdougall, William B. Scott, James G. Cartwright and others.

The Scrap Metals, Ltd., Montreal, has been incorporated with a capital stock of $49,000 by Edward J. Lyons, Henry A. Larin, Anselme G. Laporte and others.

The Hamilton Brass, Ltd., Hamilton, Ont., has been incorporated with a capital stock of $40,000 by Herbert S. Lees, John M. Telford, Robert P. McBride and others.

The Carola Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by Warren K. Cook, 262 Rusholme Road; Herman R. Petersen, 74 Hepbourne Street; Frank J. Foley, 156 Yonge Street, and others to manufacture phonographs, etc.

The Bishop Lumber Company, Ltd., Nestorville, Ont., has been incorporated with a capital stock of $300,000 by Harry H. Bishop, Harry W. Bishop of Chicago, Ill.; John L. O'Flynn, and others, of Sault Ste. Marie, Ont.

The Alberta Lumber Company, Vancouver, B. C., has been granted a permit for the erection of a lumber mill to cost $100,000.

Government Purchases

WASHINGTON, D. C., Oct. 2, 1916.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, until Oct. 10, schedule 162, for one banding press for Charleston; schedule 164, for one 200-ton gantry crane and transfer truck, and schedule 165, for one internal grinding machine, both for Washington; until Oct. 24, schedule 194, for eight turbine-driven blowers for Brooklyn and Mare Island; until date not set, schedule 198, for one electric blue printing machine for Portsmouth; schedule 205, for one combined air circulating pump, two feed main and auxiliary pumps, one main air pump and two fuel oil service pumps, all for Charleston; schedule 211, for furnishing and installing an electrically-operated refrigerating apparatus for Puget Sound; schedule 212, for one track-turning turret machine for Mare Island; schedule 214, for two carriage case annealing furnaces, two cartridge case head turning lathes, one 2500-ton hydraulic heading press and four hydraulic power pumps, all for Washington.

The general purchasing officer of the Panama Canal, Washington, will receive sealed proposals, under circular 1086, until 10.30 a. m., Oct. 19, for furnishing motor-driven centrifugal pumps; under schedule 1085, until 10.30 a. m., Oct. 30, for pumps driven by induction motors, traveling cranes, water turbine-driven exciter, etc.

The following bids were received under proposal No. 70 by the commanding officer, Frankford Arsenal, Philadelphia, Sept. 22, for furnishing under item 1 four hydraulic presses, $68,377; item 2, one duplex pump with motor, $9,300; item 3, one 300-ton horizontal drawing press, $18,200, motor capacity, 250 hp.

Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Sept. 26, for supplies for the naval service, as follows: Schedule 77, steam engineering, class 11, Brooklyn and Mare Island—Eight motor-driven air compressors with spare parts—Worthington Pump & Machinery Corporation, $30,340, $31,564 and $31,308; Westinghouse Air Brake Company, $21,719.70; Ingersoll-Rand Company, $39,064.24 and $34,338.94; class 12, Brooklyn and Mare Island—Four vertical steam-driven air compressors with spare parts—no bids.

NEW TRADE PUBLICATIONS

Engine Lathes.—Hendey Machine Company, Torrington, Conn. Catalog. Size, 9 x 12 in.; pages, 67. Pertains to a line of engine lathes for manufacturing purposes built with swings ranging from 12 to 24 in. The various parts of the lathe are described, the text being supplemented by a number of line and halftone engravings and this is followed by illustrations, brief descriptions and condensed specification tables of the various tools, including several for cutting metric threads. Mention is made of various attachments that can be supplied for relieving work, spacing the carriage, supplying power feed to the turret, etc., and a number of illustrations of motor-driven lathes are presented.

Foundry Facings, Supplies and Equipment.—Hill-Brunner Supply Company, Cincinnati, Ohio. Catalog No. 10. Size, 6 x 10 in.; pages, 352. Describes with numerous illustrations a complete line of facings, supplies and equipment for all foundry purposes. In addition a number of pages are devoted to the presentation of information that is of special interest to foundrymen. Among the subjects covered are practical suggestions concerning the elements of pig iron, rules for mixing iron by analysis, directions for cupola operation, analyses of pig iron and coke, data relating to the chemical composition of gray-iron castings for various purposes, analyses of alloys, etc. Tables giving the melting point, weight, tensile strength and specific gravity of metals and various other useful information are included.

Piston Rings.—Burd High Compression Ring Company, Rockford, Ill. Pamphlet entitled, "The Burd Piston Ring Directory." Calls attention to the various sizes of piston rings for use on different types of automobiles, motorcycles, cycle cars, trucks, tractors, engines, etc. The rings are arranged alphabetically by code words with the size of the ring and data on the various engines upon which they may be used, the model, number of rings per piston and the number of cylinders. To enable the proper ring for any type of engine to be located readily an alphabetical index at the back giving the name of the engine, the year and model and the page number upon which the ring is listed, is provided. Instructions for installing the rings and a number of tables of useful information are included.

Foundry Equipment.—Whiting Foundry Equipment Company, Harvey, Ill. Booklet No. 125, entitled "A Model Foundry." Calls attention to the general principles underlying the arrangement of a foundry and describes the various departments of an establishment producing gray-iron castings. The descriptive matter is supplemented by engravings of the equipment used in the different departments and a typical layout and list of equipment are given. Mention is also made of the equipment required for brass, carwheel and malleable-iron foundries and railroad shops.

Pumping Engines and Jaw Crusher.—Allis-Chalmers Mfg. Company, Milwaukee, Wis. Two bulletins. The first, No. 1637, refers to a horizontal cross compound crank and flywheel pumping engine. The description of the construction of the engine is supplemented by numerous halftone and line engravings, and instructions for making a duty test of the engine are given, together with data on the flow of water through pipes. A number of engravings of actual installations and testimonial letters from users are included. The other bulletin, No. 1810, gives a general description and specifications for a crusher of the all-steel jaw type. The description of the crusher is supplemented by drawings and engravings and a set of dimension diagrams and tables is included.

Furnaces.—Tate, Jones & Co., Inc., Pittsburgh, Pa. Two circulars. The first, No. 153, is devoted to a line of furnaces for heating plates for flanging and annealing, angles for bending or forming and rods for continuous bolt or rivet making machines. A number of illustrations of various types of furnaces in use supplement the descriptive matter, and tables of the standard sizes that can be supplied are included. The other circular, No. 154, points out the advantages of using the overfired type of furnace for which accurate regulation of temperature, ease and economy of operation and increased output are claimed. The furnace is built with a stationary hearth for light work or equipped with a car for work that cannot be easily handled without the use of a crane or other hoisting device. Views of both types in use are presented, together with dimension diagrams and tables.

Automatic Grinding and Polishing Machine.—Excelsior Tool & Machine Company, East St. Louis, Ill. Circular No. 27. Illustrations and descriptive matter explain the operation of an automatic grinding and polishing machine for finishing miscellaneous stove castings. Several views of the machine, showing the lid retaining rollers, exhaust system and a pipe polishing attachment are given, and a condensed specification table is included. An illustrated description of this machine appeared in THE IRON AGE, March 30, 1916.

Hardware.—E. C. Stearns & Co., Syracuse, N. Y. Catalog. Illustrates and describes a general line of hardware, including various kinds of tools, riveting machines, brackets, etc. Mention is also made of a combined receptacle and destructor of garbage and waste matter which is built in either the portable or wall type.

Water Softening.—Dearborn Chemical Company, Chicago, Ill. Pamphlet. Discusses the character of waters from the standpoint of their suitability for boiler feed. The material is divided into three chapters dealing with corrosion, including pitting, grooving and electrolysis; incrustation, including soft and hard scale of varying compositions, and foaming, including priming, bagging, causes of explosions, etc., with a discussion on oil in boilers. The various subjects are gone into at some length and methods for remedying the trouble caused are pointed out.

Traction Engines.—Tom Thumb Tractor Company, Minneapolis, Minn. Pamphlet. Illustrations and descriptive matter explain the operation of a tractor of the endless track type in which the traction element is located in the center of the rear end of the tractor. The description of the tractor is supplemented by engravings of the various parts, and a detailed diagram, in which all the parts are marked, is included.

Boiler Room Specialties.—Lagonda Mfg. Company, Springfield, Ohio. Booklet T2. Contains illustrations of different types of tube cleaners and other boiler room specialties, such as automatic cut-off valves, multiple strainers, feed water filters, valve reseating machines and automatic lubricators. One page is devoted to each specialty and the descriptions are of necessity brief, with references to the large catalog giving the detailed information.

Combination Jig Sawing and Drilling Machine.—John Royle & Sons, Paterson, N. J. Circular No. 271. Illustrates a combination motor-driven jig sawing and drilling machine in which the two sections which were formerly built separately are combined in a single unit. The construction of the machine is gone into at some length, the text being supplemented by numerous engravings of the various parts and illustrations of the machine equipped with hand and pedal control and either belt or motor drive are included.

Oxy-Acetylene Welding and Cutting Apparatus.—Alexander Milburn Company, 1418 West Baltimore Street, Baltimore, Md. Catalog No. 24. Deals with a line of oxy-acetylene welding and cutting apparatus and the applications of the process to shipbuilding, foundry, construction and repair work and the wrecking of steel structures. This is supplemented by a number of engravings showing typical shop and field repairs and cutting. The portable and stationary types of apparatus are illustrated and described and mention is made of the different torches and gages used. Illustrations and brief descriptions of the oxygen and acetylene generating plants are given and mention is made of a lead burning outfit and portable acetylene light for out-of-door night work.

Tools.—Vichek Tool Company, Cleveland, Ohio. Catalog No. 7. Pertains to a line of drop and hand forged tools which includes hammers, picks, drills, drift pins, chisels, punches, flue beading and calking tools, screwdrivers, wrenches, etc. Illustrations of practically all are presented and in a number of cases tables giving the different sizes that can be supplied are included. A number of specially-made tool kits are shown.